TEXT BOOK ON

Typewriter Repairing

The only Written Authority on
Typewriter Construction
and Repairing

Covers very simply Principle, Construction, Features, Troubles, Adjustment, Repairs, Operation of the Standard makes of Writing Machines

NEW YORK PUBLIC LIBRARY

Will increase the business scope and profit of the Tinsmith, Locksmith, Bicycle Dealer, Electrician, Phonograph Dealer, Automobile Dealer, Jeweler, Optician, and Stationer, and is of tremendous value to the Typewriter Dealer, Typewriter Salesman and Typewriter Mechanic.

Th... ...erved
Original & Copy
1216 Garden Street
Hoboken, NJ 07030

HAGLEY LIBRARY

f
Z
49
.A1
T49
1992

INDEX.

1—Introduction, pg. 3-4, inclusive.
2—History of the Typewriter, pg. 5-7.
3—Typewriters Generally, pg. 7-8.
4—Points on Soliciting, pg. 8-9.
5—Getting Wise, pg. 9-11.
6—The Typewriter Industry, pg. 11-12.
7—Typewriter Essentials, pg. 12.
8—Typewriter Assembling, pg. 13.
9—Type-making, pg. 13.
10—Typewriter Vocabulary, pg. 13-19.
11—Operation, pg. 19-27.
1—Regulating the margins.
2—Line Lock.
3—Paper feed-Carriage return.
4—Variable line spacing.
5—Putting on new ribbon.
6—Back Spacing.
7—Tabulator.
8—Samples and Tabulator Table.
12—Touch Method, pg. 28.
13—Touch Adjustment Theory, pg. 28-30.
14—Typewriter Platens, pg. 30-32.
15—The Ribbon, pg. 32-34.
16—Summary of Ribbon Troubles, pg. 34-36.
17—Carbon Paper Troubles, Remedy, pg. 36-37.
18—Underwood Typewriter, pg. 37-66.
Universal Bar, pg. 37; Key Tension, pg. 38; Escapement Mechanism, pg. 38; Typebar and Key-lever System, pg. 39; Segment, pg. 40; Type-guide, pg. 40; Typebar and Guide, pg. 40; Escapement Mechanism, pg. 41; Escapement Adjustment, 42; Side Alignment, 43; Alignment (general and shifting), 44; How to Remove Carriage, 45; How to Remove Typebars, 46; Paper Feeding Troubles, 46; Line Space Mechanism, 48; Operation of Line Lock, 49; Line-lock Adjustment, 52; Automatic Ribbon Reverse, 54; Ribbon Reverse Adjustments, 56; Ribbon Mechanism (Actuation), 57; Ribbon Adjustments (2-color attachment), 59; Regular Adjustments (general), 60; Tabulator, 60; Decimal Tabulator, 62; Back Spacer, 63; Banking, 64; General Notes, pg. 65.
19—Royal Standard Typewriter, pg. 66-78.
Typebar-Segment, 67; Ribbon Feeding Mechanism, 67; Ribbon Mechanism Adjustments, 68; Lne Space Lever, 69; Line Spacing Mechanism, 70; Paper Feeding Mech-

anism, 71; Carriage Construction, 72; Shifting Mechanism, 74; Escapement, 76; Typebar Principle, 76; Center-Margin-Tabulator Stops, 77.
20—Smith Premier (blind), pg. 78-75.
Typebar principle, 78; Carriage Construction, 79; Line Lock, 79; Ribbon Mechanism, 80; Ribbon Reverse, 80; Touch Adjustment, 81; Reverse and 2-color Attachment, 82-3; General Notes, 83.
21—Remington Typewriter (blind), pg. 85-90.
22—Smith Premier Visible (No. 10-11), pg. 90-94.
23—Remington No. 10-11, pg. 94-99.
24—Oliver Typewriter, pg. 99-102.
25—L. C. Smith & Bros., pg. 102-106.
26—Monarch, pg. 106-110.
27—Fox Typewriter (blind-visible), pg. 110-118.
28—Visible Defects or Printed Results, pg. 119.
29—Supply Houses, Questions, etc.

INDEX TO CUT BOOK 'B.'

1—Underwood Typewriter, pg. 1-8..... 55 drawings
2—Royal Typewriter, pg. 9-12..... 30 "
3—Smith Premier (blind), pg. 12-17..... 56 "
4—Remington (blind), pg. 18-21..... 51 "
5—Smith Premier No. 10-11, pg. 22-24..... 36 "
6—Remington No. 10-11, pg. 25-27..... 20 "
7—Oliver No. 3-5, pg. 27-29..... 30 "
8—L. C. Smith & Bros., pg. 29-31..... 18 "
9—Monarch Visible, pg. 32-34..... 24 "
10—Fox, pg. 35-38..... 42 "

11 Machines .....362 "

Visible Defects-Printed Results, pg. 39-43.
Standard Key-board, Styles of Type, pg. 39.
Index to sample of printed results, see pg. 119, text book.

ABBREVIATIONS.

V, vibrator; C, carriage; R, ribbon; C. B., cut book; Esc., escapement; Prt. Pt., printing point; Rt., right; Lt., left; F., Fs., Fgs., Fig., figures or cut; Pg., page; T. & M. No. 12, Thorp & Martin Catalog No. 12; Pt., point or part; T. B., text book; B. S., back space; Mchsm., mechanism; Par, Pd., paragraph; L. M., lost motion; U. Bar, Universal Bar; Tab., Tabulator; Ecc., Eccentric. Book 'A.' text; Book 'B,' cut book. V. D. visible defects. Forward means toward you; rearward means from you in the direction of movement. Normal position means in an inoperative position.

20160328, DCH.008

INTRODUCTION.

1. The object of this, is to show how easy it is for any jeweler, gun or lock smith, or bicycle repairer or general repairer to add quite a valuable asset to their business in the town in which they are located. The most important requisite absolutely necessary is a good mechanical turn of mind and a keen sense of order and arrangement. And such you have, and are using to advantage every day in your work. So, after reading this book through carefully, it will be seen that the whole thing in a nut shell is a small matter of mechanics, and which will take very little effort to apply, it being so written that no matter what there is the matter with a typewriter—to consult the questions pertaining to the defects and then to the direct way to remedy these, no time or worry is lost in wondering what the trouble is.

2. We feel sure that the following will be a source of much encouragement to you for your success in this new line. Now in a town of from 500 to 10,000 population, there are a number of typewriters far in excess of the number you imagine. This is a subject you have not thought of seriously at any one time, and we are calling your attention to it to show the vast number of good prospects you have. About 98 per cent of all business correspondence is done on the writing machine. Consider now, the fact that all business men, viz., merchants, banks, trust companies, real estate companies, coal companies, court house people, county officials, druggists, wholesale grocers, commission merchants, and in fact every up-to-date business man who does up-to-date business—are users of writing machines, you can get some idea of the number all around you. All of which are constantly in need of attention, in the way of adjustments, etc. Now, if you will look through your city directory and get the names of every business man and professional man, you will readily see what your prospects are. The majority own typewriters, very often several, and considering the fact that it is a delicate piece of mechanism, susceptible to dust, you can rest assured that you will always be busy. Now why should you not get this business when other parties, traveling mechanics, are taking it from you? As a general thing they are very successful to the extent of clearing up $25 or so, per week, from each town. Doing a general typewriter repair business in connection with your other repairing is the most logical procedure imaginable. No great amount of special tools are required, and no time is lost

in soliciting the work. Just let the business men know that you are now specializing on typewriter adjustments and they will certainly give you their patronage. If you are generally known in town your future is bright. Why? Because the majority of them realize the importance of keeping their typewriters in good condition and have a consideration for their stenographers. When a typewriter is not working properly, it is the most aggravating thing imaginable, and they will be enthusiastic at knowing that they can be relieved of such an inconvenience at home and by you on short notice, and are willing to pay handsomely. This assertion we know from experience. They themselves always realized the possibilities to the business, judging the situation from their own experience with their own typewriters.

3. You yourself may have thought of the possibilities there were to repairing typewriters or becoming a typewriter expert, but you were bound hand and foot for not knowing how to proceed. You knew absolutely nothing about a typewriter and gave up such a hope.

4. Now here is all the necessary knowledge, heretofore unobtainable, all yours for keeps, the result of the crystalized knowledge of three of the most expert men in the industry, gained after long years of close and painstaking observation and study of the adjustment, repair, rebuilding and manufacture of typewriters. Here's to your success.

HISTORY OF THE TYPEWRITER.

1. One of the larger motives actuating the American mind in things mechanical, is to make inanimate objects perform animate functions. The harvester toiling in a mass of grain, day after day, is as lifeless to the light, the air, and heat about it as the iron on which it is made—but what a human force it is:—the monster locomotive drags faithfully along its tons of freight, uttering neither joy nor woe, but measures its achievements in commerce—the typewriter, ever so small, in comparison with these two, is deaf to the motives of the operator, but consider how much depends on the accuracy of its speech—and lastly, the adding machine, without the sense of reason, without the power of memory, is as accurate, precise and comprehensive as the human brain dared to be.

2. The harvester, the locomotive, typewriter, and the adding machine are living personalities in our every-day life. But consider now how very vital is the typewriter—that mass of accumulated parts, that mechanical masterpiece, so thoroughly woven into the fabric of trade—indispensable to it—inseparable from it.

3. The typewriter was the outgrowth of commercial expansion, and at the same time augmented the still greater commercial development of the last quarter of a century, one machine doing the physical labor of half a dozen copyists, who worked by hand. The saving of wages of five is an important business economy and upon just such economy, the success of a business depends. It supercedes the pen in business correspondence, yet good penmanship was never in greater demand, than it is today. It magnifies mistakes in spelling or otherwise, punctuation, capitalization, and as a result leads to their correction. It has done more to promote the wonderful increase in business during recent years than any other office device. In fact the typewriter has made many of the modern devices necessary as well as possible. Invoicing, way-billing, manifolding, bookkeeping, etc., are all done mechanically now-a-days, etc.

4. In the art of writing, research shows nothing earlier than letters, or rather shapes, cut in stone by the Egyptians and Phoenicians centuries ago by means of mallet and chisel—the next step in advance, the 'stylus,' the use of which is so well recorded in Grecian history. Instead of stone, waxen sheets were used, thin layers of wax spread over parchment rolls, recorded the scratches made by the stylus. Research

also shows nothing later than a perfectly adjusted, easy running visible typewriter, with an adding machine attachment and an Anderson Carriage Return and the Edison Business Phonograph or Dictaphone.

5. Considering now that the typewriter industry is only 35 years old, how perfectly wonderful it is to see how its use has spread all over the world—all the more should we be proud of it as it is distinctly an American product. The inception, development and perfection of same is more interesting than the history itself. It had a rather crude origin in England as early as the eighteenth century. In America, France, and England, in the first half of the nineteenth century, several patents were issued, but it was not until the Americans, Chas. Thurber and A. E. Beach began work on it in 1843, that it began to assume commercial importance as an idea. Thurber simply had a set of type around a disk, but several years later Beach invented the basket of typebars as we have it today. A Mr. S. M. Francis added lever or pianoforte action, and Mr. Thomas Hall the inked ribbon. In 1867, Chas. L. Sholes, a printer Sam Soule, a farmer, and Carlos Glidden, a gentleman of leisure, three Milwaukee men, made the first model out of which grew the famous Remington. Only Sholes had faith enough to stay with the proposition and though one model after another broke in actual service, he had so far perfected it by 1873, that the great Remington Gun Works, at Illion, N. Y., took it up. Then for another year very expert machinists worked to strengthen it and in 1874, the first machine was put on the market.

6. Something new upon the market untried but still needed—who would be the first purchaser and who would make the first sale. To do anything first requires patience, perseverance, courage. The man who enjoys the honor of making the first sale, rather of having sold the first commercial typewriter, is William Miller, of New York City. This machine was sold to a mercantile agency which had just started up in opposition to R. G. Dun & Co. For some years Mr. Miller enjoyed the distinction of being the only typewriter salesman in New York City, Brooklyn, Jersey City and Newark. In those days there were probably only 50 stenographers in the whole city of New York, outside of professionals. The first law firm to use a machine was Sherman & Sterling, of No. 20 Nassau Street. So on to the four corners of earth.

7. Mark Twain owned one of the very earliest models of typewriters, and this was his estimate of it: "Please don't use my name. Please don't even divulge the fact that I own a

typewriter. I have entirely stopped the use of it for the reason that I never could write a letter with it to anyone without receiving a request that, by return mail, I would not only describe the machine, but state what progress I had made in the use of it. I don't like to write letters, and so don't want people to know that I own 'this curiosity breeding little joker.'"

8. However, great improvements were made as the results of the suggestions of Densmore, Yost, and Hammond—some of the latest ones being the two-color ribbon attachment, billing scales, decimal tabular, wide carriage, column finder, interchangeable carriages, variable line spacer, VISIBILITY, the adding machine attachment, and the Anderson Automatic Electric Carriage Return. A machine with all these features, meets all the demands of the business world today.

9. Records show also, that the germ of the typewriter genius, first manifested itself nearly 200 years ago, when in 1714, Henry Mills patented a writing machine designed to meet the possibilities of the manufacturer and not the requirement of the user. Patent No. 389854, August 18, 1883, granted to Messrs. Prouty & Hynes, was the first attempt along visible writing machine construction.

TYPEWRITERS GENERALLY.

1. Presuming that you know absolutely nothing about a typewriter other than that it is a mechanical device for writing letters, we are endeavoring to explain things so clearly that it is an easy matter to grasp all that is said and still more easy to apply. Now, in the process of writing an up-to-date business letter, the sheet or sheets of paper are inserted in the machine, proper margins determined, the proper line spacing, and the keys are struck. The keys are connected with bars on the end of which are steel type, which, when striking an inked ribbon, forces a contact between it (R) and the paper, consequently making an impression or duplicate of the letter or character struck. The space between words and lines is done automatically, and so by continuing the process the letter is written.

2. Typewriters of Standard make are divided into two classes—the so-called VISIBLE and BLIND writers. In the visible class the typebars usually lie horizontally and strike forward, hence the front stroke machine, making an impression that you can see immediately after it is made. In addition to that the entire line is visible as well as what you have pre-

viously written. In the blind class the bars hang vertically and in writing the stroke is always upward, and is consequently known as an understroke machine. A visible writer, such as the Underwood, is preferable in letter-writing, as the different advantages are very apparent. The construction is somewhat different, although the underlying principles remain the same.

POINTS ON SOLICITING.

1. Of course your aim is to give the most satisfactory work and service within your ability. Work that is guaranteed to give satisfaction. Don't think that because you have secured a piece of work from a prominent attorney or bank that it is the more difficult because of their more exacting demands and expectations, and seemingly have some doubt as to your ability to fix it. Such is not true, although you feel that you should give this particular machine preferred attention. A satisfactory job for a prominent party serves as a tremendous pull, although all satisfactory work is the surest, most permanent and best advertisement. In securing work it will be found necessary to call your customers' attention to the advantage of keeping his machines in good and perfect condition, its needs and the results you can produce. Remember the men you are doing business with are the ones who expect and appreciate all courtesies and a continued interest in the welfare of their typewriters.

2. Be businesslike in your manner, and approach your man in this manner: "Thomas is my name. I am representing the Central Typewriter Exchange, of Bridgeport, Conn. We are making a specialty of the care and adjustment and rebuilding of typewriters, and feeling that you realize the importance of keeping your machine in the best of running order, I desire to discuss the matter." Call his name firmly and correctly. If he is in any way interested he will invariably ask "How much do you charge for fixing or cleaning a typewriter?" You can reply that you do all work by estimate, and if he will allow you the privilege of examining his machine you would be pleased to quote an estimate. While saying this advance toward the machine and remove cover, calling his attention to things that should be attended to—talking firmly and positively—and before stating your estimate, show him its needs and what improvement you will make. You can state that after inspecting his machine you find that it is in need of a thorough cleaning and adjustment. Several of the parts are worn and will positively have to be renewed, as the case

may be. "In cleaning this machine it will be taken entirely to pieces—this, the carriage—this, the main spring—this and this will be removed—thus giving access to all the inner and delicate parts of the machine—dusted off—thoroughly washed and rinsed in gasoline—all weak and worn parts renewed and adjusted accurately—put in perfect running order and guaranteed to give perfect satisfaction." He more than likely will say "Alright, take it along." "When will you have it back?" If he is in no particular hurry, take your time. "I realize that the machine is in need of attention, but I feel that your estimate is too much." Ans. "Well, Mr. So-and-So, this work will be thoroughly done, and if unsatisfactory, you will be nothing out. It will be a matter of several hours' work, and when returned, of course you have the privilege of examining it and testing it as long as you like." "Well, can you fix this, and this?" "Oh! Yes, all that is included in my estimate. That is a matter of a small adjustment," etc. "Oh. I was seriously considering sending it back to the factory or city to have it thoroughly gone over." "Well, Mr. So-and-So, if you undertake to do that you will have express charges both ways; (find out what the exact charge will be); you will be thrown out of the use of the machine for several days, and an indefinite charge to pay, while I right here on the ground, know that I can give you work every bit as satisfactory and will be so before you are anything out. Furthermore, the speed and TOUCH of the machine will be adjusted to suit the individual." "I don't think you can fix this machine. It has given me trouble since the day I bought it." "Well, possibly your trouble is a matter of an adjustment, as is very often the case." "My experience in the business has been such that I don't think I will have any difficulty fixing your machine." It is very often a good idea when you have confidence in yourself to ask your customer to come to your shop and you will show him some of the interesting things about his typewriter. This goes far toward establishing confidence. From the foregoing you can make up a good selling talk of your own, etc.

GETTING WISE.

1. The secret of your success will be to take the initiative. Jump at the first opportunity. It is not necessary for you to know every detail of the machine before you can make any single adjustment, the tightening or loosing of a screw may be all that is necessary, or the removal of some dust or grit or the application of a little oil. If a job seems particu-

larly difficult and appears that it is well nigh impossible to remedy—by no means get discouraged. You must figure this way: that at one time it was in perfect working order, and keep in mind at all times an ideal of this perfect machine and work toward it. This method will enable you to gain the greatest confidence in yourself and overcome many difficulties easily. In this connection we wish to state that you can learn more about a typewriter by repairing old worn-out ones in six months than you can by spending three years in the factory This is the experience of those that have been there.

2. A person, knowing absolutely nothing about a typewriter, can learn a great deal about its manipulation and mechanics by watching a person perform upon it. To an observant eye, this will certainly reveal its fine mechanical points. Now to begin with, suppose you go to some office and have the stenographer write an up-to-date business letter for you, and watch closely every move—letter, line spacing, margins, shifting for capitals, etc. Gain from her HOW to write a letter—you will have the result on the paper before you—trace back as to how all this was accomplished, and then you have the mechanics of it. That is what interests you. This business is quite a mass of details. Master these and you master the profession. Ask her how she determined the margins—made the space between the lines. She certainly can tell you that. Don't think that because she is a fast operator that she knows all about the machine. She knows how to manipulate it—that's all.

3. When a machine is taken out of an office to be cleaned or adjusted and brought back in proper running order—the owner of same, upon trying it, will first see how it writes, that is, what kind of an impression it makes, and will not note the improvement in action until afterwards. He, knowing practically nothing about the mechanics of writing machines, expects to see the results of your adjustments on the printed page before him, and he does. (See page 119.) Strange as it may seem, no matter what parts are in need of adjustment, what screws are loose or what is lost—it will, in nearly all cases, show on the printed page or be apparent from the action of the keyboard. So in making an estimate, show your customer exactly what his machine needs and what results will be forthcoming by a thorough going over, either cleaning or adjustment, or the renewal of a worn part or, say, the putting on of a new platen or new ribbon—giving him a nice, clear mechanical reason why. Such goes toward establishing confidence and impressing him with your exact knowledge of the profession.

4. Such as the above tends to overcome many objections he does not make known to you. Some men think that the condition of their machine is such that none other than the makers can remedy the trouble. This is no doubt due to their previous experience with so-called experts. The more aggrivating a defect is, the harder it is to overcome, they think. Another way to show your customer that you thoroughly understand your business—is to use the technical names in referring to parts and their manipulation—such as 'TOUCH,' 'tension,' 'main spring,' 'line and letter space,' 'race-way,' 'rail,' 'carriage.' 'typebar,' 'typebar-hanger,' 'alignment,' 'platen,' 'feed rolls,' 'rigid and movable dog,' 'variable line space,' etc., and say it firmly and positively and as if you could not express yourself without the use of them. Show your customer what to expect, results and advantages, etc. The foregoing are the basic principles for securing business when soliciting.

5. In taking a machine down, note carefully the relative position and size of each screw and part, and then when assembling there will be no difficulty wondering where this and that part goes. Watch closely how a machine works when in perfect working order—noting every working part and how one part works in unison with the others—and get it firmly fixed in your mind. Then when a machine is being gone over, you will have not trouble finding the defect. Study the cuts and diagrams carefully, and you will learn quickly how to locate troubles instantly. The mention of a trouble should suggest the cause and remedy. Remember to first find what the trouble is, then find the source and then effect the remedy. Very often the operator does not seem to know what the trouble is herself. Then it is up to you. By questioning her you can get on the right track anyhow. The sooner you get started the better. You will find it the most fascinating business in the world. Be on the safe side by knowing the mechanics of the typewriter absolutely, and then you will never have trouble from the operators.

6. The way to build up a reputation in the repair business for expertness, etc., is to be sure to fix each individual machine perfectly and satisfy each customer individually. Consider each step thoroughly.

THE TYPEWRITER INDUSTRY.

1. Writing machines of today are evolutions. There is no mechanical device today which embodies as much brains, ingenuity, money and effort and has a greater amount of wear

and tear. Many of the problems which have been solved in the course of this development have been intricate, and which called for patient and careful study. It is a field in which hasty innovations and untried experiments are doomed to failure. However there is good money in original suggestions. Every piece is exactly made, regardless of the time and money required. Specially devised machinery secures a degree of accuracy and finish far above all ordinary standards. A rigid system of independent part inspection throws out every defective piece. Very often, however, defective parts are overlooked. Careful and exact methods are pursued during assembling and when completed, a corps of trained experts submit it to every test. Very often, though, this does not reveal any defect, as regular use will bring this out, only.

TYPEWRITER ESSENTIALS.

2. The present-day factors required of a writing machine are simplicity, durability, speed, and manifolding power, versatility, perfect alignment and visibility. The visible writing lends wings to the operators' fingers, encourages speed and insures accuracy.

One of the great problems of the front stroke or visible machine construction has been to provide the necessary space for assembling 42 typebars within practically a half circle, as compared with a complete circle as is the case with blind writers. The investigation as to this should reveal some interesting points, etc.

DURABILITY.

3. We will now consider what it is that makes one machine more durable than others. (See page 40, Art. 1-2.) When you consider that a modern writing machine used daily by the ordinary operator will average over 1,000,000 movements of its working parts per month and that it must be so accurately constructed as to continue such for a long period of time, the question as to what it is that contributes mostly to durability, is after all not only the quality of materials used in its manufacture but rather it is the principle of construction which is best adapted to the requirements of durability, ease of manipulation and general utility. The investigation as to the above should afford interesting research. On these points there is a wide difference in the various makes of machines. The best principle of construction must be *such as to eliminate excessive wear with the minimum of strain on the parts.*

TYPEWRITER ASSEMBLING.

4. A writing machine may be considered as composed of five different groups of parts, but all working in unison and dependent upon each other, as follows: The keyboard, which really controls the machine; the typebar mechanism, which really controls the impressions; the carriage, which controls the paper (see page 20); the escapement, which controls the movement of carriage; the ribbon mechanism, which controls the ribbon by giving a fresh portion of ribbon surface for each type. Now; if you will investigate each one of these groups separately and observe the relation of one to the other on all the standard machines, you should be able to instantly attribute any trouble to some one of the groups or more. If you are having ribbon trouble, investigate the ribbon mechanism. Also if you are having irregular spacing between words or letter investigate the escapement, and so on. (See page 16.)

TYPE MAKING.

The making of the type is perhaps one of the most interesting features of the construction of a typewriter, from the fact that the type make the impressions upon the paper, which impression on paper creates an impression on the mind. After the type dies or molds are made and adjusted securely in form, they are brought in contact with small pieces of cold rolled steel placed in a frame and pressure applied by means of a rolling process to the extent of five tons. This enormous pressure, or compression, forces protrusions of steel into the dies, thus forming the type. Afterwards they are carefully inspected and tempered. The face of the type is *concave*, in orded that they may conform to the convex surface of the cylinder. This insures a full-faced impression.

TYPEWRITER VOCABULARY.

DEFINITION OF TERMS AND NAMES IN THE INDUSTRY.

TYPE-BAR.

1. The type-bar is that part of the typewriter that holds the type. When a key is struck, rather depressed, it is the type-bar that swings upward or forward (according to blind or visible writer) and brings the type to the printing surface or point. Consequently it must be heavy and strong, for it has many thousand such operations in a day's work. See arti-

cles on type-bar, page 40, and page 67.) "Bear in mind that the different parts get their names from the very things that they do or from what they accomplish. Refer to Cut Book and get familiar with the location of parts, etc. The name of a part on one machine bears the same name on any other machine.

TYPEBAR—HANGER.

2. The typebar hanger or retainer, holds the typebar in position. The point where the bar 'swings' in the hanger is the 'bearing point' and it is the wearing quality at this point that determines the durability of the typewriter. The Remington and Smith Premier, old style, for instance, hanger is of the pivotal principle in that the bar swings on pivots and has consequently two bearing points. The Underwood and Royal have only one bearing point.

LOST MOTION.

3. 'Lost motion' means an unnecessary looseness caused by wear, vibration and improper adjustment. And causes still more vibration and unsatisfactory results in that the machine does not respond with uniformity and precision. 'Lost motion' in a typewriter is fatal to perfect results. It can be found at any bearing or wearing point in the course of time. As an example, the lost motion in the bar bearings and carriage bearing is especially evidenced by *poor alignment.* (See Alignment, page 17.)

TOUCH.

4. By the term 'TOUCH' is meant the 'feel' of the keyboard as a whole. It is governed by adjustable springs and by the relative position of the 'Universal Bar' to the typebar or key lever. It can be 'dead' and seemingly unresponsive, exceeding hard or stiff or too soft and yielding. (See special article on TOUCH, page 28, and article on 'Universal Bar,' page 16, etc.)

TRACKING.

5. The term 'Track' means exactly what it implies—that is for the type to coincide with its own impression again either across the page from left to right or up and down the page. For example, to write several lines and to return to the original one and duplicate it in its own tracks or else insert some

more in line with this line referred to. If it doesn't 'track' properly it will be evidence by a double character and blurred impression, and the insertion not in line. Very often there is occasion to run the paper up three or four spaces in order to make an erasure easier and after doing so, the paper is brought back to its original point seemingly, but the line will not be in its proper position for the insertion (correction), and will be either above or below the printing line. This trouble is caused by a poor condition of the feed rolls and platen (see article on Platen), improper adjustment of the spacing pawl and platen ratchet, etc. This term is also applied when the spacing of the paper is irregular, in that the distance between them varies. This is especially noticeable on the single line spacing and for this reason it is with difficulty that you make a perfect insertion or duplication of the original line referred to above. Same causes. Tracking trouble on all typewriters is common, and is one of the greatest troubles encountered. See 'Visible Defects,' on page 119.

PRINTING POINT.

6. All type strike the platen and paper at a common central point through guides or ribbon shields, according to the method of construction. The printing center is the point where every operation of the machine completes itself in one unit of effort.

7. All standard typewriters are constructed along two lines either with a basket or carriage shift. In the first case is meant that the entire assemblage of typebars must be shifted in order to make Capital letters. In the second case the typebar basket is stationary and the Carriage with its contents and attachments must be shifted in order to receive the Capitals. In each case the arrangement of the small and Capital type are just the reverse of each other. As an example take the Underwood Typewriter, which is a carriage shift machine. The capital type are at the extremity of the bar, and the small further in. Take the Monarch or L. C. Smith, which are Typebasket Shift machines, and the small letters are at the extremity of the bars and the capitals further in. Get this point firmly fixed in your mind. See article on the adjustment of the small letters to the capitals under article 'Alignment,' page 17.

FEED. (*See page* 20.)

8. The term 'feed' as applied to the manipulation of the paper in the machine means to space and make ready for a

new line. As applied to the ribbon, it is meant for it to move along space by space and make ready for a new type impression. In the first case if the paper does not *feed* properly it will be evidenced by tracking troubles and with carbon feeding troubles and it will be with difficulty that an envelope or stiff card is gotten into the machine. (See article on the Platen and its troubles.) In the second case if the *feeding* of the ribbon is irregular it will be evidenced by an imperfect type impression, etc. (See article on the Ribbon and Visible Defects, page 119.)

THE UNIVERSAL BAR *versus* TOUCH.

9. In typewriters the movement of the 'Universal bar' governs the action of the machine (Important). *Each key moves this bar.* The light or heavy TOUCH of a typewriter depends chiefly upon the resistance of the Universal bar and the manner in which that resistance is transmitted to the operator's fingers through the keys. The mere lifting of the typebar offers very little resistance. The Universal bar in some machines invariably begins its movement the instant the key is depressed and resists the finger action throughout the entire key depression. This causes a stiff unresponsive TOUCH and is very tiresome. The ideal arrangement is as follows: "The universal bar should not begin to move until the typebar has nearly reached the 'printing point.' Therefore there is no resistance until that time when the momentum of the bar overcomes the resistance offered by the universal bar at about the time the operator's fingers have ceased their pressure on the keys and are releasing them. In other words, instead of depressing the combined weight and resistance of the typebar and Universal bar, this ideal arrangement requires the depression of the weight and the resistance of the typebar only. The resistance of the universal bar is not felt." (See article on Touch Theory, page 28.) The movement of the universal bar governs the throw-of dogs of the escapement mechanism, and determines or rather contributes to the speed of the carriage in writing, etc.

THE ESCAPEMENT.

10. The word 'escapement' refers to that part of the typewriter consisting of the escapement wheel and the escapement

dogs. These are mounted on what is termed an escapement dog block. The purpose of the escapement is to allow the carriage to 'ESCAPE' when a key is depressed, and so make ready for a new type impression. In other words, it determines the spacing between letters. Perfection in this part of a typewriter implies a device that will actuate the platen *immediately* after each type impression is made without any perceptible effort on the part of the operator. All the machines of today are of the 'Rotary Escapement' principle, meaning that there is a revolving or rotating movement to this mechanism. (See U. E. M., page 38.) The old style escapement is termed the 'RACK' escapement, and the rotating movement is not present.

PITCH.

11. The term 'PITCH' as applied in the typewriter industry really means the number of spaces to the inch. The pitch varies according to the size of the type as regards its width. It varies from about 8 to 12, meaning that if a machine makes 8 spaces to the inch, it is equipped with M. R. Gothic type, and is an 8 P. machine. When it makes 12 spaces it is equipped with Elite type and is really a 12 P. machine. You will notice that all scales are usually divisions of 10—like 10-20-30. The number of subdivisions in an inch shows how many times the machine spaces to an inch and whatever the number is—the pitch is of the same denomination. (See styles of type, page 39, Book "B.")

ALIGNMENT.

(See C. B., page 40, Ex. No. 1.)

12. To align, really means to straighten or put in line. Doubtless you have often heard of the alignment of the rails and roadbed of a railway. In this connection, it means the lowgrade, evenness and straightness of the track. So, when the 'perfect alignment' of a writing machine is spoken of the evenness and straightness of the letters or impressions is meant. In other words the impressions are in their proper position. When 'it is out of alignment' the reverse meaning is meant, and is evidenced by an irregular space appearing between each impression; that is, one letter will be too close to the other or slightly above or below it. Again, the Capitals may be higher or lower than the small characters, which latter is expressed as 'The capitals are not in align with the

small letters,' or the 'Shifting Alignment.' Perfect alignment contributes greatly to a 'letter perfect letter' and it is for this reason that great emphasis is given to the alignment. The entire machine is constructed to one end and that is to contribute to 'perfect and PERMANENT alignment.' Of course, as expressed in these terms it excludes any possibility of improvement and is only an ideal condition which will permit such indefinitely.

The art of aligning a typewriter is very simple and easy to acquire and requiring a small degree of patience. The secret is all in knowing the proper relation of the Carriage and platen to the typebar and type. If you get that firmly fixed in your mind, you will know instantly how to align a letter and do away with all guess work. (See page 119, on Alignment and Visible Defects.) (Also Underwood and Royal Typeguides, pages 40-67.) The durability and permanency of alignment are almost entirely determined by the typebar and hanger construction as it is at this point that nine-tenths of the wear of the machine occurs. A typewriter in its final analysis is nothing more than the typebar mechanism and its attachments.

BANKING.

13. This term means the settling of the carriage upon its return for a new line. Irregular 'banking' is evidence by a dropping back or advancement of one space or so from the point at which the margin stop is set. Evidenced by an irregular left margin of printed matter. (See T. B., page 64 and C. B., page 40.)

MANIFOLDING.

14. By this term is meant to make duplicates or many copies of the original letter simultaneously in any desired number by means of carbon paper. (See page 36 on Carbon paper.)

STENCIL CUTTING.

MIMEOGRAPH.

15. Stencil cutting is to make impressions on wax sheet for mimeograph or press. In doing so, the type strike the wax sheet direct and does not strike the ribbon. It is necessary to disengage the ribbon throw mechanism in stencil cutting.

MANIFOLDING ALIGNMENT.

16. There is such a thing as manifolding alignment. Some machines in perfect alignment for single copies will be very badly out of alignment, if several carbon copies are made at once. This is caused by the necessity of a harder stroke on keys, lost motion of carriage, which in this case is exaggerated seemingly. Again, the real cause is that when the necessary number of sheets to produce the desired number of carbon copies are inserted, the circumference of the cylinder is increased (printing surface) and the common center of the printing point is changed. Letters coming from all directions, fall short of the central printing point, causing imperfect alignment of letters. This could be grossly illustrated by attempting to place the tips of all the fingers of one hand (excepting the thumb) on a perfectly straight line and in no way bending them in order to make some of them reach the line. The line representing a line in perfect alignment, and the distance the fingers fall short of it, compares with the type failing to strike the central point of printing. This is found on the Smith Premier No. 2, and the Remington, Nos. 6 and 7, etc., and all those machines having a complete circle of bars. You will observe that this is applicable to mostly blind writers. It is due to the construction of the machine itself, and cannot be remedied by you, and is given you as a side light on a possible complaint. (See C. B., page 41, line 12-13.)

OPERATION.

1. The following articles are given so that you can know what to expect as to the accomplishments of a typewriter, and by following closely you will observe the mechanical reason for each move. Refer to page 10, par. 2.

REGULATING THE MARGINS.

2. (See page 77, Royal Margin Stops.) Of course, provision must be made to accommodate varying widths of paper or other material and which will in themselves determine the length of the line written thereon. They, the margin stops, determine the length of the line on sheet, no matter how wide. The margin stop rack corresponds with the front scales as regards its graduations. So that to set your margin at No. 10, on the rack, will cause the line to begin on the paper at No. 10, etc. One margin stop determines the beginning and the other the ending of the line.

LINE LOCK. *See page* 52, P. No. 13.)

3. When the end of any predetermined line is reached, the levers of the machine are securely locked against any depression, the alarm automatically ringing before arriving at that point where the locking occurs. The line can be continued by releasing the line locking mechanism by several spaces. The advantages of this feature are such as to prevent operating beyond the edge of the paper and prevents the writing of one character over the other (piling), which would occur if the carriage was not stopped and the keys not locked automatically.

PAPER FEED AND CARRIAGE RETURN.

4. Drop edge of paper well down on the rubber feed rolls back of the cylinder. Turn the cylinder from you by either one of the platen knobs until the lower edge of the paper has passed an inch or two beyond the line guage in front of the aligning scale, pulling it under the margin clamps. Now, if the paper was started in crooked or the condition of the feeding mechanism such that the paper is in crooked, release pressure of feed rolls upon paper by pressing or holding down the feed roll release lever key, which makes it so that you can adjust the paper only with your hands at will. Be sure to always return the release key to its proper position.

5. The line spacing is accomplished when the carriage is returned to begin a new line. To return the carriage to begin a new line, pull the line space lever with a gentle pressure to the right until brought to a full stop by the margin stop. This movement simultaneously revolves the cylinder, carrying the paper to the proper position for the next line, and returns the carriage to the beginning of the writing line. (See page 70.)

VARIABLE LINE SPACING.

6. This includes writing on ruled lines on paper, interlineating, when extra wide or irregular spacing is required, or when the lines on paper do not correspond to the regular spacing of the machine. The above is accomplished at will by hand, and to do so the Platen Ratchet with its detent must be made inoperative. Take for instance, the Fox machine. To accomplish this, remove the lever of the platen detent forward. By pulling the detent lever as far as it will come, it

automatically sets a brake on the platen so that the platen can be turned to any desired position and still be held firm. This is necessary when in writing on ruled lines the writing does not correspond to the regular space. When the detent lever is moved only part forward, it leaves the platen entirely free. (See Smith Premier Visible Variable L. Space.) When the variable line spacing arrangements are thrown into use. the platen may be turned and the paper brought forward or back to the exact point desired. The point or line written upon must be in line with the aligning scale throughout its entire length. Attention may here be called to a rule for operation which suggests a singular advantage of the variable line space features.

7. "Punctuation marks should be struck with less force than other keys, as, having smaller writing surface, these characters are apt to puncture the paper and indent the platen." (See article on Platen, page 30.) Will call your attention to those machines not provided with a really complete mechanism for doing this. You will notice the holes in the platen are very noticeable and are all in a straight line. This will show you how often these characters are used, not only at the end of the line, but throughout its entire length. And on these machines mentioned, the entire surface of the platen is not used, such as that portion lying between the lines. Now, by means of the variable line spacing mechanism, these points where the type strike can be shifted so that they will strike where heretofore they didn't. So by shifting this position from time to time the entire surface of the platen can be struck and utilized to the minimum of danger of indentation from the punctuation marks, etc. It is the constant pounding in one place that works damage to the platen resulting in negative results.

"TO PUT ON A NEW RIBBON."

8. Wind all the ribbon onto one spool while on the machine; lift that spool out of the cup; detach the old ribbon and place the end of the new ribbon under the clamps next to core or hub of spool; then push the clamp down until it snaps and holds the ribbon securely; or use the other means of attaching; this done, return the spool to its place and the ribbon can be wound on it; then remove opposite spool from cup or ribbon from opposite spool, as the case may be; take off old ribbon and attach the new ribbon and proceed as above with first spool. (See article on Ribbon, page 32.)

ESCAPEMENT, LETTER AND WORD SPACING.

9. The spacing between the letters or words is automatic with the depression of any key or the space bar as the case may be.

BACK SPACING.

1. The back spacer is useful in bringing the carriage back a space or so in order to insert an omission or fill in a correction. It can also be used as a 'condenser' for inserting a long word where a short one has been erased. This is accomplished by holding the key partly down until the character has been printed. Seven letters can in this way be written in five regular spaces. This key is also useful when columns of figures are added in the typewriter and the total is to be written under the column. Thus—

```
   1.61
6355.00
  42.22
 123.10
-------
6521.93
```

In totalling the above figures, place the carriage so the printing point comes under the last column. Write 3, then press the back space key twice; this will bring the printing point under the tens column; write 9, press key again twice; write period and proceed as before. All of which allows you to control the carriage from the keyboard, which is convenient. As you see, at each depression of this key, the carriage is moved back one space. This key should not be struck as other keys, but should be pushed down as far as it will go, and then release it.

TABULATING AND HOW TO USE THE BACK SPACER IN CONVERTING A COMMON STOP INTO A DECIMAL TAB.

2. To preserve a line of decimal points in writing columns of figures representing dollars and cents, set the tabulator stops on the rod to include the highest amount to be written. For instance, if writing a column of figures in which the largest items would not go higher than hundreds, set a stop at the

point where 100 would come in the column, say at '50,' then the decimal point will come at '53,' and to write hundreds you would begin writing where the carriage stopped. Write say 555 for dollars, then the period for the decimal, and then 55 for cents. So to write $55.55, press the tab. key when the carriage comes to a stop, strike the space bar once, and write 55.55. To write $5.55, press tab. key; when the carriage comes to a stop, strike the space bar twice for hundreds and tens, then strike the 5.55. To write 55 cents, press key, then strike space bar 3 times, for 100,10,1, strike period and then 55. The column will then appear as follows:

555.55
55.55
5.55
.55

3. Now if it should be found necessary to write an amount larger than hundreds, such as 1789, press the tab. key in the usual way and then, after the carriage has come to a stop, press the *back spacc key*, once for thousands, twice for tens of thousands. You will see that after numbers pass the hundreds, or after the carriage has come to a stop, it is thrown back one space for every unit increase as compared with the striking the space bar when decreasing.

Thus to write the following, observe how—

5555.55
555.55
.55 etc.

TABULATOR.

(See page 60, and page 89, note No. 8.)

COMMON STOP AND BILLING OR DECIMAL.

1. As you doubtless know, the tabulator (Common Stop) is most useful in jumping the carriage from one position to another in listing items in columns and where it is desired to have all the first figures in line, as

9264
47
82
350
60987 etc.

The stop tabulator is found on the Underwood, Royal, Monarch, L. C. Smith, Fox, and practically all of them, except the No. 6 and 7 Remington. By referring to page 22, you will note how by means of the Back Spacer a common stop tabulator can be useful for writing dollars under dollars, cents under cents, and bring all the periods into line. This is converting it into a decimal tabulator.

2. Of course, it is obvious that this method would be laborious to those operators making numerous columns of figures in dollars and cents—and so to do away with such, a so-called Decimal Tabulator is used, and which action is such, as to bring the carriage to a stop, and after writing the dollars and cents all the *decimal points* will appear directly under each other in the column, the dollars, no matter what denomination, will appear at the left of decimal, and cents at the right. This arrangement is the Gorin Tabulator. You will note that it is an attachment having a rack stop retainer, and having ten keys. The depression of any one of these keys will cause the carriage to jump. Wherever the stops are set on the rack, their position will determine where the periods will be, rather decimal mark (.). Of course any and all the keys can be used on any of the stops. (C. B. Pg. 21; Figs. 36 to 41.)

3. Now place one of the tab. stops on the graduated rack Pt. 34 at the rear of the carriage, at the figure on the scale where you wish the periods or decimal points to be written. Then draw the carriage to the extreme right and depress the tab. key, and the carriage will skip to the point at which the stop is set. As an example, suppose you set the stop at 35 on the stop rack, and you should desire to write a number such that one figure will be before the decimal and two after it. A number such as 2.53, for instance. For practice, first strike the decimal key marked with a period, which will jump the carriage to point No. 35. At this point make the decimal (.) and then draw the carriage back to zero on front scale, and then skip it again by depressing the second key (units), and upon releasing this key, print the figure 2, after which the carriage has spaced to receive the decimal again. Print it and then the carriage will be in position to receive the cents. So write the cents (53). Or you could have written the cents immediately after making the decimal originally.

4. From this operation you will note the following. That the decimal was made at the exact point at which the stop was set or at 35. The depressing of the second or units key brought the carriage to a point *one space to the left of the point*, and the cents followed in succession to the right of it.

Remember the tab. rack is scaled to correspond with the front scale.

5. In writing a larger number, count in your mind how many figures—in the dollars part of the number and whatever number—there is; it shows how many spaces to the left of the decimal point the carriage must be brought in order to make the dollars to the left and cents to right, and all decimal points in line. For instance, you desire to write 32567.98, and you will note that there are five figures in dollars and the stop in this case is set at 35, as above; these five figures must be to the left of point 35. In this case you depress the 10,000 or 6th key, so that figure 3 will be printed 5 spaces to the left of point, and the rest follow in succession. After writing them, print the decimal which will fall at 35, and the cents follow in succession. "Figure 7 for units, 2nd key; figure 6 for tens, 3d key; figure 5 for hundreds, 4th key; figure 2 for thousands, 5th key; and figure 3, for tens of thousands, 6th key." For practice, you may strike off the first figure and then the first two, and so on, and then write the remainders. And the keys used in each case will descend in denomination.

6. There being only one stop used in this practice, now set several stops, and remembering that each one will represent a column, and proceed as above with each one.

SAMPLE OF DECIMAL TABULATING AND COMMERCIAL BILLING WORK.

THE TYPEWRITER PUBLISHING COMPANY,

National Bank Building,
Invoice No. 7865. Terms Net Cash.

Richmond, Va., Dec. 15th, '11.
Messrs. Texarkana Typewriter Exchange,
Texarkana, Ark.

To balance acc't July 6th.....243.87	Aug 5th.....24.45	Oct. 5th.....678.09
Account credited " 3rd..... 3.87	" 1st.....21.09	" 1st..... 24.99
Balance due 240.00	3.36	653.10

Acct. No. 25678. To Messrs. International Export Co., Bremen, Germany Nov. 13, '11.

July 23rd, '11. 3000 Booklets, 'Typewriter Secrets,' @ $10.00 each.....	$30000.00
July 20th, '11. 56 Gross Typewriter Ribbons at $100 each	5600.00
Oct. 3rd, '11. 1 pr. Nine pronges at 5.65.....	5.65
Sept. 5th, '11. 65 Special Instructions.....	117.50
	$35723.15
Less 20 per cent discount for cash.....	7144.63
	$28578.52
Acct. credited Nov. 24th, '11.....	576.00
Balance due	$28002.52

Send money by New York, or National Exchange or Post Office Orders. Second Consignment.

DECIMAL TABULATING TABLE.

Set the stop again at 35. This will determine the location of decimal or period, if writing dollars and cents. So, to proceed—

To write .33——The carriage must be brought to a position 1 space to the right of 35. Press period key, make period, and which will be at 35 and then the carriage has spaced into position to receive .33 as desired. } ..... USE DECIMAL OR PERIOD KEY.

To write 3.00. The carriage must be brought to a position 1 space to left of period.
Use 2nd or units key:

To write 33.00 " " " " " " " 2 spaces left.
Use 3rd or tens key.

To write 333.00 " " " " " " " 3 spaces left.
Use 4th or 100 key.

To write 3333.54 " " " " " " " 4 spaces left.
Use 5th or 1000 key.

To write 33333.33 " " " " " " " 5 spaces left.
Use 6th or 10000 key.

To write 234786.87 " " " " " " " 6 spaces left.
Use 7th or 100000 key.

Dividing these numbers into two columns they should appear as follows:

.33	3333.54
3.00	33333.33
33.00	234786.87
333.00	3333333.33 Etc.

Remember if you wish to prefix the dollar mark ($) before each number, it is necessary to allow one space for it. So in counting the figures include this mark as a figure so as to throw it into proper position.

(Refer to C. B., page 39.)

LEARNING TO WRITE BY TOUCH METHOD.

1. The following shows the easiest methods of mastering the keyboard of a writing machine by allotting certain characters to each finger so that if certain characters are to be made, they will not and should not be unless made by certain fingers. Master every character in each of the four banks of key characters by composing words which contain letters which are shown on each bank. Do this for each bank or row of characters, and then compose words whose letters are shown on the 2nd, 3rd or 4th, or vise versa.

Then write words covering all three banks or rows, and by writing the following lines or sentences you will be able to use every character on the board. Then practice on the following sentences, which contain all the letters in the alphabet:

PRACTICE SENTENCES.

2. 1. Just one hour of steady, exact work is of greater value than a dozen hours of spasmodic bustling. 2. We bought six puzzles, a quire of very good white paper, some jet black ink, and 'Typewriter Secrets.' 3. The black jury fixed up the question of prizes with the government. 4. We dislike to exchange job lots of sizes varying from a quarter up. 5. Now is the time for all good people to come to the aid of their party. 6. The quick brown fox jumped over the slow rabbits. 7. Fill my trunk with ten dozen liquor jugs. 8. This is a sample of the work done on this machine. 9. Q. J. Vandz struck my big fox whelp.

2nd row—Queer, peer, try, tuition, were, etc.

3rd row—all, lass, salad, shall, flash, had.

4th row—None can be written. No vowels.

2nd and 3rd row—Saw, walk, request, property, why, words, write, require, wired, your territory.

2nd-3rd-4th rows—Thanks, again, instant, proper, valued, favor, banks, books, credit, same, careful, attention, course.

Now, with all fingers busy and the work evenly distributed, write the above sentences.

TOUCH ADJUSTMENT THEORY.

1. "Did you ever stop and consider why it is that a typewriter needs to be adjusted separately and differently for different operators? Now suppose that a properly adjusted machine requires twelve ounces of pressure or rather a 12 oz.

blow to depress the key and make the impression. This machine is given to an operator who, when she or he strikes a key expends a force of 16 oz. The operator complains that the machine runs stiff and hard. The party who adjusted the machine is told that the touch is too heavy. When he lightens the tensions, he is told that the machine is now worse than it was before, and is now stiffer than ever. Then he increases the tension, which makes the machine require more force to run it, so that it takes a harder blow on the keys to operate it. The operator tries the machine and then says that it is much lighter. The tension is increased a little bit more and she says then that it now is all right, that it runs just right and just suits.

2. Sometimes the party making the adjustment laughs to himself and thinks that the operator does not know exactly what she wants. He has made the machine heavier, but still she says that it is now easier to operate and is lighter. Is this not seemingly conflicting? This is the scientific explanation of this human nature technical puzzle—.

3. Did you ever strike at something and miss it? Did you ever go up a strange stairway in the dark, and take a last step up when you had reached the top, and find that there was no step there? Either one of those experiences jolted you somewhat. Did you ever pick up an article thinking that it was heavy and immediately finding that it was not? That jolted you also.

4. Now apply the foregoing experiences to this adjustment. Now consider that every time the operator struck the keys she expended a force of 16 oz. The machine required a force of only 12 oz. to operate it.

5. The excess power which the operator used was enough to let her fingers end the stroke with unnecessary force. She received a jolt on her finger every time she struck a key just as you did when you took that last step, and there was no step there to receive your foot. There was not enough resistance in the machine tension to use up the force she expended. When the party increased the tension of the machine, he made the force necessary to operate the machine, equalize the force expended by the operator in operating the machine. He has made the two forces work in unison. All the force expended by the operator was then used in operating the machine. He has by equalizing the two forces done away with the hard jolt at the end of the stroke of the key. We might say that he has established an equilibrium and that one force balances the other.

6. On the other hand, you may have the opposite condition where the operator expends say nine oz. in striking the keys. The party making the adjustment is told just the same as he was before, that the machine is stiff and hard to operate. But a case of this kind is easily adjusted by decreasing the tensions. It is another case of equalizing the forces, *i. e.*, the force necessary to operate the machine is brought to a point where it uses all the force expended by the operator in running the machine.

7. You may ask as to how to distinguish the two cases. These two cases can often be distinguished by the work turned out by the machine. In the first, the work will have a general heavy appearance, with the punctuation marks driven deep into the platen. In the second case the work is of an uncertain appearance, with faint impressions here and there. These evidences must only be considered when the operators complain along this line of discussion.

8. This theory has passed the theory stage. It has proven to be a fact from experience and has been worked on for several years. It is one of the interesting problems which *experts* have to contend with, and it all goes to show that sometimes when making adjustments they must not be governed by circumstances but by the operator."—Courtesy of "Office Appliances."

9. The foregoing was given as a side light of the touch adjustment as seemingly all operators have a pet touch and means of satisfying them are sometimes contrary to all known mechanics.

TYPEWRITER PLATENS.

1. The platen is made of a rubber preparation reasonably soft and resilient, to withstand the impact of the type, so as not to be injurious to it. A standard high-grade platen is made from absolutely new pure rubber and not an ounce of reclaimed rubber enters into its composition. The pure rubber insures the proper degree of resiliency for the perfect printing impression. Perfect cylindrical form and uniform ends provide level and correct paper feed.

2. Great emphasis must be placed on the platen. It is known as the heart of the typewriter. Upon it depends, as like the cylinder of the printing press, the character of the work produced. Much dissatisfaction with various machines may be traced to the condition of the platen. It is the equalizer of the varied strokes of the operator. Allowed to become very hard and indented, it prevents perfect printing, destroys

the alignment, damages the face of the type, and cuts out the ribbon very quickly. Through proper treatment, the life of the machine is prolonged. Platens often cause the wasting of valuable time, in repairing, as very often, this is caused by the untrue condition of the platen, and which an expert often fails to discover, until he has tried repeatedly to make the machine turn out pretty work. The best service from the machine depends upon the proper recovering of the platen as necessity requires. Its condition causes many complaints, repairs and annoyances to the operator.

3. A platen, after two years' use, should be renewed. It becomes hard and indented, and causes negative results as stated above. One of the troubles encountered on all makes of machines, even new ones, is the paper feeding or slipping trouble. This is especially noticeable when feeding in envelopes. This is caused by the smooth, glazed condition of cylinder surface generally, and in this case it should be removed from machine and ground down with emory cloth or paper, and the feed rolls also. Its entire length should be abrased lengthwise first to remove the glaze and then ground around as upon a lathe, then put the proper dressing on. This process is also used when the platen is rough and indented, which is caused by the period, comma, and dash, and which condition causes an indistinct impression. It must not be cut down too much, as the lower or upper portion of the long type like 'p,' 'f,' 'g,' 'j,' will not make a full impression. When very badly indented and hard, it should be renewed.

4. The platen consists of a wood core, rubber cylinder or printing roll, and two metal end plates. To remove shell or cylinder remove the small pins in the end thereof and slide off. In most cases, it is better to heat it over hot flame and then cut it off with a knife. In putting on new one, slip it on like a sleeve, but if you find it necessary to force it on, it is liable to split and swell beyond its proper size. In this case, the wood core should be ground down some or else another shell tried. Cores are seldom of the exact diameter. Cylinders are not interchangeable; that is, a Remington cylinder cannot be used on S. Premier, or vice versa. A hard platen can be softened by a good soaking in alcohol. Alcohol is also useful in removing the glaze from the cylinder surface. In putting on new cylinder, be sure to replace the pins, driving them slightly below the outer surface. Cylinders should be stored in a dry, cool and dark place. Do not handle same with bare hands, nor allow it to become in any way greasy or oiled. To do heavy manifolding, a hard platen is preferable. Small

or Elite type requires a hard platen. A brass cylinder is often used for very heavy manifolding. Put at least two pins in end of cylinder and see that the end plates are tight and firm. See that the platen is securely set on the platen rod and screws tight.

THE RIBBON.

(See page 119.)

Here is the exact width of ribbon for all the Standard Machines covered herein:

Remington No. 6 or 7	1 3-8	inches.
Remington No. 10	½	"
Smith Premier No. 2	1½	"
Smith Premier, 3-color	1 3-8	"
Smith Premier No. 10	½	"
Oliver No. 3 or 5	7-16	"
Underwood No. 4 and 5	7-16	"
Underwood, 2-color	½	"
L. C. Smith & Bros	½	"
Royal No. 1	7-16	"
Royal, 2-color, No. 5	½	"
Monarch	½	"
Fox Visible	½	"

2. Each machine has a ribbon of fixed width and the length thereof should not exceed 27 feet. The difference in width of S. P. No. 2, and Rem. No. 7, is hardly noticeable, unless scrutinized very closely. However, this difference is shown very forcibly when you attempt to interchange a S. P. on a Rem. machine. It will not feed or wind on the spool evenly—folds on edge, crimps and locks motion of the machine. The substitution of a Rem. for a S. P. is possible, and in most cases works perfectly. An Oliver ribbon cannot be used on L. C. S. or vice versa. Ribbons very often vary in length, exceeding about 27 feet, as some manufacturers make them longer as some inducement to purchase. No more can be safely used with perfect results. It will cause locked motion of machine, faint impression, and holes punched in ribbon. When your machine shows any of these troubles, investigate the ribbon action as it very often gives trouble.

3. Do not attempt to interchange S. P. No. 2 and Rem. No. 7, two-color ribbons. When at regular intervals a blending or overlapping of colors occurs, investigate width of ribbon used, and also the ribbon mechanism. When placing a rib-

bon on machine, wind it entirely on one spool and after attaching it to the other spool, repeat the process, to make sure that it has not folded or twisted, and watch closely as to whether it is too long. If it is too long, it will show itself by an increased pull or binding on the ribbon winding mechanism showing that one spool is too full.

4. The shifting of the ribbon from one spool to the other is done automatically on S. P. No. 2 and No. 10, Rem. No. 6 to No. 10, late model Underwood, new model L. C. Smith, Monarch and Fox. Upon examination, these automatic devices will be found very ingenious and interesting. It will be well to test this feature sure before returning the machine.

5. As information (see page 110), a ribbon should last, well according to the use and number of letters written and depending upon the condition of platen and quality of ribbon. If the platen is hard or indented, a bad impression will be made, and the ribbon battered and perforated. If dry, the impression will be indistinct. Also the texture, fine or coarse, determine the impression made. A coarse textured ribbon will make a heavy, ugly impression, a fine textured one a sharp, clear imprint, provided the type is not filled up and the platen meets perfect conditions.

6. On the Rem. (blind), S. P. No. 2 and No. 3, Monarch and Fox, the ribbon movement is not left to right only (or vice versa), but at the same time it oscillates. That is, the movement is crosswise as well as lengthwise, consequently the entire surface of ribbon is struck by type but never more than once at the same place, when winding on either spool. (See page 88, par. No. 8.)

7. On the Underwood (new), Monarch, Royal No. 5, and Fox Visible, L. C. Smith, Rem. Visible, S. P. Visible, and Rem. No. 7, only one half (½) of the ribbon is used at a time. By ingenious shifts the other half can be thrown into use to the exclusion of the other edge. The lower edge for these machines is very often given over to the use of red color, which is used in billing work and for giving emphasis to a statement. On old style Underwood and Royal, it is necessary to reverse position of spools to use the other edge of ribbon.

8. The fabric used in the manufacture of the better grades of ribbons is the finest quality of imported Nainsook, closely woven of fine even thread, spun from the best long fibre Sea Island cotton. This fabric is best adapted for absorbing and retaining the ink, used in making the ribbon. Every possible test is given to determine tensile strength and wearing

qualities and inspected to the extent of removing all loose particles or 'nap' which causes TYPE FILLING. The inking of the ribbon is done by special machinery, so that every fibre is thoroughly soaked and the colored ink forced and ground into it, for an even distribution of ink throughout. They are wrapped in tin-foil to prevent drying out. Ribbons are made to different degrees of inking and for special purposes. Dry or lightly inked ones are especially designed for use on machines equipped with ELITE TYPE, or for hard touch operators. A medium is used generally.

A SUMMARY OF RIBBON TROUBLES.

(See V. D., Page 119 and Page 120.)

"There is a point in a worn ribbon which we examine most carefully as showing us indisputably whether the trouble is really due to the ribbon or to the machine itself. This is the type track. The path made by the type as the ribbon feeds back and forth through the machine, 1st, whether the feed operates regularly, irregularly, or intermittently; 2d, whether in a wide ribbon, the lateral motion is constant and whether the adjustment allows the wear of the entire ribbon surface; 3d, whether the reversing of the ribbon is properly accomplished; 4th, whether in the narrow ribbon as much wear as possible has been obtained.

1. "In the first case one will observe in a properly worn ribbon that the fabric has been subjected to a constant and even pounding throughout its length, and in even type tracks (regular) and across its width in seperate tracks, if the feed operates thus. (S. P. No. 2, and Rem. No. 7.) Evidence of hard pounding in one spot, less severe wear for a space or so and then hard wear, etc., shows irregular ribbon feed, while a succession of small holes at irregular intervals with hardly any wear on the ribbon between them, shows an intermittent ribbon feed which fails to act, except as the vibration of the machine only occasionally brings the mechanism into active operation. These last two difficulties are oftenest met with in some of the visible typewriters. A complaint of uneven inking is also explained in a similar manner, as continued writing in one spot will deplete the color at that spot and the last impressions will naturally be weaker than the first, so that the writing will have a shaded appearance.

2. "Occasionally a wide ribbon will be found which has been used only on a single type track throughout its length. Ref-

erence is made to ribbons used on most all visible writers provided with colored shifts or machines (blind) which are using color device for a solid color. This shows either that the operator has failed to use the other tracks, or that the automatic lateral motion has failed to work. On account of this difficulty, some operators may get but one-sixth the wear of ribbon while others get five-sixths.

3. "Complaints are sometimes made that the ribbon sticks at the end and is defective because it has worn into a hole at that point. The cause is obviously that the ribbon was not reversed properly, either by the automatic reversing mechanism of the machine or by the operator. It is obvious, though hard to convince some operators, that a hole in the extreme end of the ribbon caused as above explained, reduces the value of the ribbon but a small amount, as it indicates no liability of the ribbon to break down when properly used, etc., and involves only a small part of the wearing surface.

4. "Narrow ribbons, used on visible writers, are frequently discarded after the ribbon is but half used up. A two track ribbon, while receiving the wear of lower case letters on one track and the capitals on the other, as first put on the machine, receives comparative so little wear on the portion taking the capitals, that the simple operation of turning the ribbon the other side up, either by hand or by means of the mechanism provided for throwing into use the lower edge, will bring the volume of writing on a comparatively unused portion, and thus make the ribbon last almost double the time. There are causes other than those mentioned above, which can also be said to be in part due to the machine, but chiefly to the operator's manipulation. Among these we may mention filling the ribbon spools too full with portions of different ribbons, and which enables the operator to use two colors. A ribbon spool will, of course, clog the mechanism, and prevent the ribbon feed from working properly and regular. TYPE FILLING is often due to two causes, for which the operator alone is directly responsible. If, in oiling the typewriter, too much oil is put on the type bar bearings, it will run down the bars and get on the type and when next that type strikes the ribbon a certain amount of oil will be deposited in the ribbon. This will instantly cause a heavy, smutty impression, loosen up the color in the ribbon and cause it to stick to the type. Every time the oily spot is written over the same thing will occur to other type, and so trouble rapidly piles up from a small beginning. An operator is sometimes not careful in making erasures, but allows the particles of erasure dust to fall down

on the ribbon. This tends to fill the type and causes speckled writing. Also remember that a copying ribbon will make a water or press copy, and a record one will positvely not." Courtesy "The Carter's Ink Co." Boston, Mass.

CARBON PAPER TROUBLES AND REMEDY.

1. In the manufacture of carbon paper, the ingredients are tissue paper, color, wax and oil. For typewriter use, the standard is an imported tissue of fine strong fibre, free from weak spots and holes, and not spongy, but chosen for wear resisting powers and the property of taking and holding the coating. Wax and oil are used to give body, elasticity and a wearing surface to the color mixture.

2. Typewriter carbons are of numerous styles and finishes, each of which is determined by the use for which the paper is designed. Cardon paper should always be stored flat and in the dark to prevent it from curling and fading. Some little experimenting will be necessary in determining the carbon of proper finish to be used to obtain the best results on paper of different surfaces and thicknesses, such as hard, smooth, glossy, soft or dull. A good carbon copy cannot be made when the platen is indented or filled with holes.

3. When the condition of the feed rolls and cylinder surface is not ideal, the path is obstructed and not enough pressure exerted by the feed rolls, the carbons, with the copy, will sometimes feed up faster than the original sheet. This is known as "CREEPING." (See page 47, pr. No. 3.)

4. "SMUTTING" of the copies is very often caused by using too heavy paper or wrong carbon with copy; by erasing the ribbon impression over the copies; feed rolls are too tight; or by exerting pressure on the auxiliary feed rolls, while inserting copies in the machine. This last is liable to occur on S. P. No. 2 and Rem. No. 6 or No. 7, etc. Again, always have the size of the carbon sheets conform to the size of paper sheets, exact length and width. Be sure to insert the copies evenly before spinning the platen, otherwise it will feed through unevenly and will wrinkle. Even after you have inserted the copies, release the feed rolls once, so that the carbons will adjust themselves naturally. You will find this last idea is especially good when you are writing on or are making copies on very thin onion skin paper. SMUTTING is the same term as OFFSETTING.

5. "TREEING" or the wrinkling of the carbon in the machine, may be the result of not inserting the carbon sheet even

with the rest of the paper, by UNEQUAL pressure of the feed rolls and by the carbon becoming crumpled or wrinkled by lying loose on the desk. To guard against this trouble, release feed rolls as in the other case, and use carbon sheets that are not curled and wrinkled. The resulting carbon impression, from it being wrinkled, looks like a tree with its branches.

6. A very hard indented platen and the hard use of period, comma, hyphen, etc., destroys a sheet of carbon paper quickly. Paper for carbon duplicates should be of reasonably good quality. Otherwise the impressions will be blurred and indistinct. In general, a hard-smooth platen is best for manifolding. A hard finish carbon with a hard platen. The foregoing is given as general information so as to be prepared for carbon troubles. (See page 30 and for other information, see page 19 on manifolding alignment.)

THE UNDERWOOD TYPEWRITER.

1. The Underwood Typewriter has been before the public for nearly 15 years, during which time several hundred thousand have been sold. In its early history, it was manufactured by the Wagner Typewriter Company, of New York City, and was bought by Mr. J. T. Underwood, manufacturer of typewriter ribbons, etc., factory, Hartford, Conn. At the time, it was the first practical visible front stroke machine sold, and it embodied some very basic, practical and ingenious ideas. These remain to this day in an improved form. Their slogan is "The machine you will eventually buy." It is complete in every respect.

THE UNIVERSAL BAR.

(See Fig. No. 1, 7, 18.)

2. Instead of transmitting the return power of the type bar indirectly from the universal bar to the key levers, from the key levers to a series of connecting links, and from the links to the typebars, the Universal Bar 6, of the Underwood acts directly on the typebars 2, the force transmitted direct giving them as rapidity of movement heretofore unknown but eagerly sought for. This accounts for the great return speed of the bars when writing, and prevents them from piling and hanging up. It is governed by the Universal Bar Bracket Spring 12, which is a delicately adjusted spring and is the second governor of the TOUCH. (See article on TOUCH and how

determined.) It also supplies the power for the ribbon feeding mechanism on this bar return movement. (Read the ideal arrangement governing the TOUCH.)

KEY TENSION.

(See Fig. No. 1 and 0.)

3. The key depression as regards length and tension is absolutely uniform. The individual key tension A, overcomes weight of bar and is located near the lever 4 fulcrum, permits the uniform adjustment of all the keys. These key tension springs vary in strength slightly, and so more adjustment will sometimes be required on some than others. These screws are held in place by a plate A^1, and having two sides flat to prevent them from turning from vibration, etc. In adding more tension, turn these screws only one-half turn at a time, to insure uniformity of key tension. Constant use will weaken these springs and will require tightning occasionally. This necessity is shown when the bars are sluggish in returning, and have a tendency to hang up. Very often they will vibrate unnecessarily when they return to the basket rest, and are not level with the balance. This condition prevents speed, as the bars will tend to hang its neighbor. Bar rest pad will become pounded flat by return of bars, and which will also cause bars to vibrate after returning to rest. Adjust rest support to right, or else remove pad, raise by pounding edgewise. This trouble is shown more on bars 'O, I, E, A, U,' because these are used 75 per cent of the time in writing. The above evidences must not be confounded with the trouble occasioned from an accumulation of erasure dust and oil in the segment 3 slots, and which causes the bars to hang, rather not to return to rest. In this case the segment slots should be thoroughly cleaned. This should be investigated closely. To test the key tension, depress the space bar, which will throw out of commission the Universal Bar 6, and then the return of the bars will be governed by the tension springs A, alone. Driving the screws in increases the tension. The tension springs are held in place by small abutment on the lower edge of key lever and small cylinder in the retainer plate.

THE ESCAPEMENT MECHANISM.

(See Fig. No. 8, 9, 12.)

4. A very important device is the Escapement Mechanism, which controls the intermittent lateral movements of the

platen. On the Underwood it accomplishes this with a degree of speed and precision that is remarkable as it is the heighth of perfection of the improved 'Rotary Principle.' The wearing qualities of the parts that effect the release and catch movements (movable 28, and rigid dogs 25) are such as will withstand the severe shocks given thousands of times daily for several years. This mechanism is very efficient. The fastest operators in the world make 14 impressions per second, which demands of the escapement 14 release and 14 catch movements per second. The ultimate speed efficiency of it is 20 strokes per second, with 18 as the limit for perfect results. This is the ideal mechanism of the Rotary Type, and if you will study it carefully, you will understand all others.

THE TYPEBAR AND KEY LEVER SYSTEM.

(See Fig. No. 1, 7, 2.)

5. The combination of key levers and typebars with their connecting links and the mounting system form a very important part of the typewriter details. To secure a light uniform TOUCH with ample power for heavy manifolding work and absolute alignment of printed matter, and always with a controlled evenness of impression, can only be reached through superior design and workmanship. The extreme simplicity of the Underwood Key and typebar system contributes much to the excellent results obtained. A Key Lever 4, a Typebar 2, and a connecting link 5, form the complete working combination. As before stated, it is this part of the typewriter that usage will soon produce ill effects, if faulty. The action of the typebar 2, to move the Universal Bar 6, which prepares the 'releasing dog' of the escapement just before the impression is made, is not only a sure means of releasing the Escapement at the proper instant, but it is done without being felt by the operator.

6. Look at this bar and observe the fine points. (Fig. 2.) It is of the best sheet steel, beautifully designed. Where it engages the segment it is especially hardened. It is reinforced by crimp up its middle, and which insures strength and flexibility, so that it will assume its natural position when sprung out of place. The alignment is practically accomplished when the type 2, is electrically soldered on the bars 1, and before the latter are put in the machine. Just below the type is a small abutment 5, which protects the face of the type from being battered by striking on backs of others. Each bar is numbered. A rigid curve and abutment situated a little be-

low the middle of the length of the bar, acts as a stop or limit to the strokes of the type so that the impressions are very uniform, under varying degrees of key pressures. This in a way prevents the period (.) and comma (,) from perforating the paper and denting up the platen. The abutment 4^1 on the segment 4, assists in this limited stroke. The bars are easily and instantly taken out and exchanged. (See page 46.)

THE SEGMENT.

(Fig. 2.)

7. The Segment is very important. Through its entire length is a steel rod 7, on which the bars are hung by the hook 6, on the bar. The bars fit in the slots 3, cut by special machines and fit very compactly and snugly. All the slots converge accurately to a common center, the printing point. This method assists in the accurate alignment. (See Fig. 23; Pt. 3^1-4^1.)

THE TYPE-GUIDE.

(Figs. No. 4, 5, 6.)

8. The permanency of the alignment on the Underwood is materially assisted by the typebar guide so located that it does not interfere with the visibility of the writing, while affording a perfect locking device for the type when at the printing point by preventing any side motion of the bars.

THE UNDERWOOD TYPEBAR AND GUIDE.

(Figs. 4, 5, 6.)

1. The correct scientific principle of controlling the typebar for permanent alignment is to have a guide at the printng point, while to try to control the typebar from its pivot bearings is wrong logically, as it puts too much duty and strain on the bearings and causes alignment troubles. This has been an evolution.

2. It is a positive fact that any typewriting machine which has its typebars guided at or near the printing point is more durable than one having them guided from the pivot bearings, because practice has demonstrated that the alignment is maintained a very much longer time. (See article on alignment, page 17.)

3. We will endeavor to call your attention to a few fine points covering it. This guide B^2 terminates at its upper end in the jaw formation B^1, and has at its lower extremity two

screws shown in dotted lines G, for securing it in position to the segment. You will see that between the two lower screws G, and the jaw B¹ in the guide, there are three adjusting screws. Of these three adjustment screws, one is in the center C, and one E, on either side of the body of the guide. The upper center screw C is for the purpose of spreading the jaws B¹ of the guide or permitting them to close up; the screws on either side E, are for the purpose of tilting either side of the jaws up or permitting them to drop down. This adjustment serves to take up any wear or slack in the guide or any of the printing parts. There is a fourth screw D, which positively prevents any of these adjustments until it has been loosened. You will find this screw on the right hand side of the guide just above the center screw C, and lies across the guide. The only object of this is to lock any adjustment made to the guide. In making any adjustment on this guide, first loosen this screw D, and if you want to take up wear in the guide unscrew the center screw; then tighten screw D. This necessity will be evidenced by a looseness to the typebars when held in the guide. If the slot 3 in guide is too close, it will be shown by a number of bars sticking therein. However, it is seldom found necessary to make any adjustment on it. Don't confuse this hanging of the bars with the trouble occasioned by their being sprung out of position from rough use, etc.

4. The bars have a tendency to stick in guide when nose of abutment or heel 5, is battered or flattened. Provision is made in guide for this by having small cutout B4, F2 in upper end of guide. However, file away this flat point whenever found.

UNDERWOOD ESCAPEMENT MECHANISM.

1. Fig. 8 shows rear view of this mechanism. Fig. 9 shows front view when it is taken from machine. Fig. 1-7 shows its direct connection with typebar through Universal frame 7, and Universal bar 6, at a point 2a when operated. It is this direct connection between the two that permits carriage to move in such harmony with the typebar action. The entire mechanism is assembled in a frame or bracket, fixed to rear base. In center of bracket is pivoted a dog plate 26, on which is mounted a dog (loose) 28; upper ends are caused to engage a toothed wheel 31. This wheel is well mounted on upper bracket, with ball bearings and is caused to rotate by force communicated to it by the carriage letter space rack 4,

teeth of which engage pinion 34 on wheel. Said rack, supported by roll 54, has a transverse movement, resulting from action of main spring on C. The dogs at point of contact with wheel are caused to effect a release and catch movement with the teeth of wheel, resulting from action of type-bar on Universal frame, movement of which rearward effects the release from wheel of dog 28 and throws rigid dog 26 in operation.

2. In Fig. 1-7 you will see that Universal frame is mounted on arms 9 of bracket 10, and by a small extension through segment, and that its movement is in direct line with rocking of dog plate. This rock of plate is limited rearward by screw 17 and forward by screw 18. In normal position Universal bar is held forward by adjustable spring 12, attached to slide pin 13 and Universal frame. The dog plate, by spring 19, also adjustable. Screw 16 in upper end of plate serves to contact with Universal frame to effect the release of dog and rock of plate.

3. In operation, key lever 4 is depressed and through link 5 and cam connection therewith, bar 2 is caused to move up and rearward. The heel 2a on bar strikes Universal bar when face of type is about 1¼ inch from platen, causing it to move rearward, and which striking plate causes it to rock on pivots, effecting release of loose dog 28. The dogs have merely changed places and no rotation of wheel 23 results until lever 4 is returning to normal position, during which, Universal bar returns to normal position, releasing plate, when wheel revolves until again caught by forward rock of loose dog. The instant release of plate is assisted by action of spring 19, and beveled edges of teeth that contact with a bevel edge on rigid dog tooth as shown by 21, Fig. 12, and allows a quicker disengagement of the two and drop of carriage.

ESCAPEMENT ADJUSTMENT.

4. There are times when the improper adjustment or defect to this mechanism may cause skipping trouble.

5. Remove all lost motion from entire assembled mechanism. Or increase tension on spring 19. Or tighten arm that holds cam screw 40, Fig. 11. (Covers poor spacing of C.)

6. If the carriage skips spaces, sometimes intermittently, also examine rack 4, and see if there are any broken teeth, 36. If not, look at the dogs. If there is any degree of wear on point of dogs, that contact with wheel, it will allow it to slip around between them. In this case see that dog 28 is well up

against plate 26, and drive in the tripping screw 24-16. Examine teeth of pinion wheel 34 for broken teeth, and see that pinion pawl 38 springs are correct. Remove lost motion from wheel 31 bearings by adjusting lock nut 32.

7. Trip screw 24 should be adjusted to drive dog 28 out of escapement wheel when bar 2 is about 3-16-in. from platen. If too far in, will lock motion of bar.

8. See that wheel check at Pt. 22, F. 14, is normal, and not retarding rotation of 31. If carriage skips immediately after using space bar and evidenced by double space between words, remove play between space bar rocker arm 42 and the Universal bracket arm 8, as shown in Fig. 25. Arm 8 is an extension of arm 43, as shown in Fig. 8. Said bar should return quickly and its limit stops adjusted.

9. When teeth 36 of rack 4 don't engage pinion 34 deep enough, skipping results. Lower rack in this case, by turning 60, F. 13, to left. Rack should have some tension on it.

10. A sluggishly traveling carriage may result from improper adjustment, causing piling of letters and poor alignment. Take lost motion from wheel 31, Escapement frame and bracket, and side play from dog plate 26 and dog 28. Adjust plate by screws 27. The carriage slide rod should always be well oiled, if not, carriage will move sluggishly. Lubricate all bearing points on machine and if there is too much play in typebar guide, remove same by adjustment. (See page 40.)

11. To prevent carriage from dropping to left until impression has been made, trip screws 24 may be driven in slightly. This will overcome a tendency of letters to blur or double.

12. The escapement should act so quickly after the impression is made, and the adjustment be such, that the carriage will move to left before the bar 2 has returned one-half inch from the printing point.

SIDE ALIGNMENT.

1. There is more than one thing that contributes to poor side alignment. This means the regular or irregular spacing between letters. They may tend to pile and vary in spacing. Although the guide may be serving its purpose, there are other adjustments that contribute to best results. Poor escapement, loose spacing rack, loosely adjusted carriage, and slow movement to it. It would be well that the platen fits snugly in carriage skeleton, with no edgewise play. Its adjust-

ment on platen rod or with thin washers, removes this play. The right platen knob should be adjusted tight enough to permit carriage to be shifted with freedom. A collar is provided thereon to assist in this adjustment. The eccentrics, Fig. 16, should be adjusted edgewise to remove play in carriage lift hook journal E, Fig. 15. On some machines the right lift hook is slotted to engage a guide attached to C frame. See that this guide is tight and works free therein. Do not have an excess tension on carriage. This causes vibration. The carriage should now be shifted to see that all four corners of it come to rest on the frame simultaneously, which it should. Remove lost motion from rack by bending inward the arms thereto.

ALIGNMENT—(General and Shifting).

1. If there is an unusual play to bars in guide adjust same. If bars are bent out of position, bend back. If you desire to raise both type on bar lengthen cut bar by hammering on curve thereto. To lower both shorten bar by increasing curve. Both at Pt. A-F. 2. Cut type, to raise letter singly.

2. The shifting alignment is regulated by the two slides on each end of C. (inside), and serves to limit shift of C. upward by striking abutment W, Fig. 15. If capitals are lower than small letters, adjust slide down slightly. If above, visa versa. Remove play between stud on tappet 46a, F. 37, and top plate, as capitals will be lower than small. This should not bind.

3. The shift balance spring should allow carriage to drop to normal position instantly when released. Connecting the C. skeleton with frame is small curved connecting link on right between them. If this link is bent, it will not permit C to settle quickly, causing cap. and small to vary. This should work freely.

4. C. is locked down in normal position by latch 17, F. 29. The shifting portion of C. is attached to shaft rail 4, fixed on arms of frame 3, and extending forward. Another arm 3a, extends downward, on end thereof is pin 16, which engages recesses 17a, which lock C. up or down as desired. Shift key 13 has pin 23, which, when depressed, rocks arm 22 forward and arm 20 down, action of which raises latch sufficently to release pin 16, permitting C to shift through action of upright arm 15 from shift key (pivoted at 14), on shifting frame, pivoted at 2, and caused to rock. The C. as shown in F. 29 is locked in upper position. Locking lever 18 has at 19 a spring that tends to hold latch 17 down normally. The

rocker shaft 21 extends across the machine, and on right end of which is crank arm 26-F. 27-28. The right shift key has pin 24. Upper end of arm 26 carries a lock 28 pivoted at 27 on arm.

5. If lock 28 is pressed down and key depressed, carriage will lock in upper position. (Fig. 28.) To throw lock 28 up, and depress key, the pin 24 will be prevented from entering the recess 25 on account of prong 28a, and thus no C. lock results. The latch 17 may be adjusted rearward to remove a looseness from C. when in normal position, by screw X. The spring at pivot 19 tends to also hold arm 22 in upright position, and to throw arm 26 rearward into locking position as in F. 28.

HOW TO REMOVE THE UNDERWOOD CARRIAGE.

(See Fig. No. 29.)

1. In order to get free access to the inner workings of the machine it is best to remove the carriage. This is very easy to do. First unhook the carriage draw band from the right under side of the carriage when pulled to the extreme right. Then hook it to the strap anchor post situated an inch below your hand on the frame-work. Then remove the two plate screws from the front top plate located in the extreme front of the machine, remove plate, taking care to fix in your mind the location of the small square shaped lug to which the right screw is attached. Pull the carriage to the extreme right, and slide off the main slide rod, but when moved about an inch beyond the limits of the margin stops you can then disengage the center rail 4 and clamp 5 under the carriage, and slide off the carriage entirely.

2. When replacing, reverse the operation, but to properly and quickly engage the center clamp with the center rail 4. it is best to depress the shift key 12, which throws this rail 4 up into the proper position to receive it. Still better depress the shift key 12 and with the other hand immediately grasp the rail 4 so that you can raise or lower it to the position at will to engage the clamp 4. Afterwards slide on the carriage. Care must be taken not to allow the carriage to, in any way, strike on the ribbon shield as this will bend it out of proper position and cause trouble. If in this operation, the carriage should seemingly become separated and one side refuse to settle to rest, this will show that the shifting portion of it has been disengaged on the side from the retaining arms.

REMOVING UNDERWOOD TYPEBARS—(F. 3-8-9).

1. The Underwood removable typebar feature is famous and contributes to ease of manufacture, repair and convenience. In so doing the arrangements that hold the bar in position are shifted and not changed permanently. F. No. 1 shows the Universal bar as holding the bar in position. Fig. No. 3 shows the hook 6 that engages the bearing 7, and said hook is not closed but permits bearing to slide in or out.

2. The locking arrangement is controlled by two levers 42-63, F. No. 8-9. To remove bar, reach to the back of machine and swing lever 63 on its bearing 64, and press in or rock inward lever 42. This movement throws the Universal bar rearwardly, and by holding levers in this position, the bars can be pulled out. Raise bar to be taken out, one inch above its normal resting place at an angle as shown in F. No. 3. Take hold of bar firmly, give it an upward motion, and draw the bar out. Do not bend or force it. If the machine is equipped with 2-color ribbon attachment, throw on the mimeograph switch or ribbon silencer. This permits the Universal bar to be thrown away more. After pulling out bar loosen from connecting link.

3. In replacing bars, depress the key corresponding to the bar, taken out, until the link comes forward so it can be seen. Attach bar to it, depress levers as above, and slide bar in, and then release levers. Several bars may be taken out at once. Now, in replacing them in quantities, we would advise you to depress the levers as instructed above, and place a small block of wood under lever 42, between it and the escapement frame base 4. This will hold these arrangements in inoperative position for the insertion.

PAPER FEEDING TROUBLES.

(See page 74)

1. Referring to page 30, covering the platen, etc., you will get an insight to the causes of irregular paper feeding. This trouble on all machines is the most frequent, and in most cases is due to the surface condition of the cylinder and feed rolls. It becomes glazed and smooth and very often the operator will complain that he or she is having spacing trouble when in reality it is paper feeding trouble. When your attention is called to this in any case, examine the first conditions. If the trouble is caused mechanically, or from the improper adjustment of this mechanism, make a systematic investigation of all the parts that enter into this operation.

2. See that the feed roll release rod operates freely. Depress the paper release lever partially down and it should return to its position quickly.

3. See that the feed rolls press firmly on the platen.

4. See that the rolls rotate with freedom on their shafts. The roll separating sleeves are sometimes too long, which does not permit freedom of movement. But if they have too much play, it will sometimes cause the paper to slip edgewise. In this case shorten the rod or shaft by filing it slightly, etc.; 1st case, shorten sleeve.

5. See that there is an even tension on all the rolls. This tension is regulated on the old style machines, by steel strip springs, attached to eccentric turns held in place by set screw. Release this and revolve this turn slightly to increase tension. Get all the screws in line and the tension can be regulated better. However, on the later machines, this tension is regulated by coil springs and to adjust, you only have to turn the adjusting screws without having to take off the carriage. The nickled springs control the rear rolls.

6. See that there is a clearance between the paper shield and the cylinder. There should be no binding between the two. There should be an edgewise play to the detachable shield on the later machines. If this shield should be found binding on the cylinder, the proper adjustment can be made by properly bending the small upward projection on the rear edge of shield. They should all be in line. Bend out to make a better clearance.

7. See that on the surface of the table or shield that there are no rough places or burrs in the metal which will cause the paper to hang. See that the table attaching screws are driven in, to prevent the edges of the paper from hanging when inserting. On the older machines the shield and the table are one piece. In this case see that there is the proper clearance between it and the cylinder, especially opposite the rear feed rolls. See that the eccentric turns for regulating the roll pressure, do not in any way bind the retaining arms. To test, depress the roll release lever fully and return to position gradually, and see if the arms follow this movement with regularity and ease.

8. The proper adjustment of the margin paper clamps determine good paper feed at the bottom of sheet. There should also be a clearance between them and the cylinder, only the small rolls contacting. Both should be adjusted to exert an even pressure and the rolls should always rotate. The lower extremity of the clamp should be slightly bent forward so as to

properly grasp and guide the paper after passing beyond the front feed rolls. Keep the clamp slide rod well oiled, etc.

9. Should the edge of the shield project forward too much to the extent that the type will sometimes strike it, bend said edges toward the cylinder slightly.

10. The front aligning scales should be adjusted so that they will stand back slightly from the platen by 1-16 of an inch, etc. Always return roll release lever before moving carriage. See that the front paper clips are thrown away from the cylinder by 1-8 inch, and that they exert an even pressure. If not they cause trouble. The two prongs on each should contact the platen. If not the ribbon will hang on the prong or any burr thereon. Investigate this closely on machines equipped with same, and those having paper feeding or spacing troubles. When cork rolls are found on machine, replace with rubber ones, as they are the cause of much paper feed troubles.

UNDERWOOD LINE SPACE MECHANISM.

(Fig. No. 22-22′.)

1. Very little trouble is to be found with this mechanism. Complaints worded 'the machine don't space right' is often misleading. In analizing the case, it is well to be sure that the mechanics of it is correct, and then proceed by suggestion made in previous article.

2. In operation, this mechanism is about the same as the Royal spacing (page 70), so refer to it as it is clearly explained. This mechanism co-operates with a line space lever (9) located on left of C. frame, in describing platen as desired. It is mounted on the left C. skeleton (4), and has the usual ratchet (5) fixed rigidly to platen rod. Through an extension of C. skeleton is caused to be operated a plate (8), and to which is attached spacing pawl (10), on forward end. Pawl is held in normal position by detent spring (13). Rear end of pawl rests on a support, attached to the space regulator lever (20), movement of which determines how soon pawl shall engage ratchet (5) and thus regulating space between lines. To adjust lever (20) forward, allows pawl to engage ratchet in early part of its rearward movement, and thus revolves platen 3 spaces. This mechanism, including line space lever, returns to normal position by action of spring (16) attached to plate and frame. The throw of the pawl is determined by the operating channel of lever (9) in left C. frame. There is also a small projection (15) from skeleton, which

serves as a bracket for the plate (8), and which being located in path of pawl, serves to hold pawl in operative position in ratchet tooth at end of pawl travel. You notice upper point of pawl is a cam.

3. Now, if projection is adjusted too far forward, it will lock pawl between the two, and plate will not return to normal position. In this case bend projection rearward.

4. If it is bent too far rearward, it will allow pawl to ride up on side of R-tooth and cause ratchet to rotate more spaces than regulator is set for. For instance, if set for one space, it may space twice., or if set for two spaces it may space three times. This irregularity is very seldom found.

5. This may also cause ratchet to turn slightly more than set for, and when mechanism has returned to normal position, the detent roll settles down in notch between ratchet tooth. This may not occur until writing has begun, when the platen will suddenly settle, causing a broken line. Line seems to run up hill, or the first capital will be much below the line. (V. D. L. 25.)

6. Now if there is much lost motion to the shifting part of carriage or the point of pawl is worn off slightly, the ratchet will not be described enough to effect a perfect engagement of notch with detent roll, in line spacing. This will be shown by the line being broken as before, but in this case running down hill. To remedy this case, renew pawl and remove lost motion from C, as per page 45, Par. 5, and see V. D. Line No. 25. This broken line is noticeable on all machines when the rotation of platen ratchet is irregular.

7. The plate (8) should not bind in its bracket. Will not return when depressed. The above irregular spacing may be due to the feed rolls not being tight enough or else the ratchet detent spring (23) is not strong enough. The detent disengaging cam (X) swings on platen rod and should be free. The cover plate (X′) should not bind on plate (9) at point (O), nor on arm of line space lever. This will cause poor shifting alignment, and carriage will return from upper position sluggishly.

OPERATION OF UNDERWOOD LINE LOCK.

1. By referring to cuts covering this mechanism, F. No. 37 shows this mechanism in normal or inoperative position. Fig. 38 shows it partly operating, having rung the bell only. Fig. 39 shows it fully operative, having rung the bell and locked keys against further operation. Fig. 40 shows it having been

released for the addition of several more letters at end of line. When these extra letters are printed, this mechanism again takes Fig. No. 39 position.

2. Figs. 41-42-43, show a side sectional view of the real locking mechanism. F. 41, in normal position, F. 42, locking position, and F. 43, released for additional letters. These last three cuts are side views of Fig. No. 46, which comprises the real locking mechanism. G is a transverse rocker shaft across bottom of machine, and adjusted therein by collars H¹ and 4. To this shaft are fitted collars H to which are upright arms F, upper ends of which are connected by rod E. To the left shaft adjusting collar H¹ is a vertical arm K, which contacts with pin L′ in dog L4 pivoted to vertical lever L and L5, in such a way that the fore and aft movement of Arm L rocks the shaft G with its attachments, into position to lock keys against operation, as in Fig. No. 42.

3. The frame work as shown in Fig. 46 is strengthened by arm O in certer. Upper end of this arm has extension O′ & O′ which serve to limit the oscillating movement of locking rod E. The normal position of this rod, as relating to these extensons, is as shown in Fig. 42, held to the left O′ by spring P pivoted at P′. The return of this entire rack to normal position is caused by action of small coil spring Q, wrapped around left end of rocker G.

4. The other parts that co-operate with this rack in locking the keys are an upright arm 24 F. 40, extending down from a margin stop rack 39-41, attached to slide rod 7, and made to swing on this rod as a bearing. This rack serves as a retainer for a margin stop 44, which is adjustable to any position by means of stop pawl 54, which engages notches 17 in slide rod 6.

5. To margin stop 44 is fixed a cam 45, having a bevel at point 48-48a. To the carriage frame in front is attached a tappet 46a, with two cam projections 46-47, the function of which is to press down the cam piece 45, thereby giving said stop, rack and arm 24 a rocking movement, and swing on its bearings on rod 7, and thus ringing the bell and locking keys through medium of dog 22 and pin 26 and 29.

6. In other words, when the projection 46 during the letter feeding movement of the carrage rides upon the bevel 48, this cam 45, with stop and stop rack, is depressed and rocked on rod 7, and thus swinging forward arm 24 and causes the trip 22 to force down the cam 25 and lift the bell hammer 20, continuing until the hammer is released and the bell sounded as shown in Fig. 38.

7. The further movement of carriage brings cam projections 46-47 to position shown in F. 39, and causes sufficient additional movement of 24 to lock keys through medium of shaft 28, rod 29, and vertical arm 27. If it is desired to release keys to add more letters, a button 35 is pressed inward so that cone like cam 36 may engage the yielding arm 24 and press same to the right, so that pin 26 may slip past arm 27, releasing latter which returns to normal position as shown in Fig. 40.

8. Now to go back a little, as you know during the movement of carriage to left, tappet 46 first strikes bevel 48, depressing it enough to ring bell only. After carriage proceeds further the tappet 46 strikes the higher cam 48a, thus depressing, rather swinging arm 24, enough to lock keys as in Fig. 39. The projection 47 in the meantime having served to prevent arm 24 from returning to normal position. At this point the button 35 is pushed, releasing the keys, and then as the keys are struck the space between tappets 46-47 comes to a point above cam 48a, where the latter, with stop and rack and arm 24 are permitted to rise, and the arm 24 may swing backwardly to enable pin 26 to catch behind the crank arm 27. The continued left movement of carriage, causes tappet 47 to ride upon cam 48a and relocks the keys at about the same time that the carriage becomes locked by engagement of side of arm 46a, with the stop 56, which serves as the extreme limit of carriage travel.

9. When both are free to return to normal position the locking rack or rod 29 is assisted by coil spring coiled around left end of rack shaft 28. The arm 24 with cams and rack, with stop, is assisted to normal position by spring 57, coiled on left end of rod No. 7.

10. The extension 46a, with tappets 46-47 thereon, is adjustable horizontally by set screw therein. This is to permit a well timed locking of the keys, through the rocking of cam. The carriage spaces to left about seven spaces after bell rings, at which time the keys lock first time as in F. 39. Upon releasing same, carriage spaces four times, when it locks the keys the second time. Further release permits one space.

11. Understand that all this mechanism co-operates with a hook 31, which extends upward from the key levers 32, and said hook engages 29. When the keys are depressed, it may happen that one key will be in the lower position, with bar at printing point (F. 45), when locking rod 29 swings forward, so that the rod will be over said hook instead of under same. This would permit the key to be further operated, if the hook was not provided with a bevel A3, on its upper edge. So

that the return of key lever to normal position, has a tendency to throw rod 29 out of its path in a rearward direction. As before stated this rod oscillates, being limited by O'. AGAIN, NORMALLY, THE LOCKING ROD E-F. 42 IS HELD FORWARD BY SPRING P SECURED TO ARM O AT P'.

12. Again, the forward travel of arm 24 is limited and determined by the swing resulting from the depression of cam 45, by tappets 46-47. So this movement would limit movement of rod 29 if it were not for the fact that arm 27 is adjustable forward and rearwardly. In case crank arm 27 is adjusted too far rearward, it will contact with pin 26 during the early part of arm 24 movement, and thus give rod 29 a greater throw. Now, as this throw is limited by back side of hook 31 extensions, the entire mechanism would hang up, even the carriage, if the oscillating movement of rod E through spring P' was not provided. This arrangement has a tendency to overcome this limited movement of locking rod No. 29-E. If this adjustment is noticeable, change position of arm 27 slightly forward, as the first arrangement may cause carriage to move slowly, causing letters to pile, at locking point, and a decided resistance in returning the carriage.

ADJUSTMENT OF LINE LOCKING MECHANISM.

13. By referring to page No. 20, Art. No. 3, you will read what is to be expected of perfect operating line lock. On the Underwood, this mechanism is unique, in that it will allow the keys to be locked twice in succession. The troubles, encountered may be one of the following. 1. The mechanism may not lock keys at all; 2, may lock the first time and not the second; 3, may not lock the first time, but the second; 4, the carriage may move sluggishly during this operation; 5, the locking may be intermittent; 6, the bell may not ring; 7, and the locked keys cannot be released by depression of push button 35.

14. First you will notice the rack, holding the margin stop with its cam 45, swung on rod 7 as a bearing, on regular machines is held in position by sleeve or collar at right end of rack. See that said collar is adjusted, to permit rack to swing freely on rod 7, but don't allow any lost motion in same. See that the bearings of the stop 44 and rack are well oiled, free from dust, and the spring 57 is operative. This precaution will overcome a tendency of mechanism to remain in depressed position and intermittent locking.

15. See that the lock rod E-29 stands no further away from hooks A3-31 than 1-16 inch. This is the normal position of

same, and may be adjusted to that position by collar 4, through medium of screw J and pin extension therefrom. This collar permits the edgewise play to shaft G, and there should be no lost motion to it. This adjustment covers the first and second trouble. The sluggish return of arm 24 covers second also. Again, this trouble may be due to the second tappet 47 being too high and not allowing a full depression of rack and arm 24, in which case bend 47 down level with 46. Again, the arm 27 may be adjusted too far rearwardly.

16. In the third case, the tappet 46 may be adjusted or bent up too high. In this case make it level with 47.

17. In the fourth case, the trouble may be due to the extreme position of arm 27 as outlined on page 52, Par. 12. Again, either one of the tappets 46-47 may be adjusted too low, thereby giving too great depression to cam 45 or else the margin stop rack is binding and is not free. When stop is set at extreme left, the carriage at this point should move fast enough to permit letters from piling. Again, if tappet 46 is too low, it will prevent keys from locking the second time, as it will not permit cam 45 to recover sufficiently to allow a second engagement of pin 26 with 27. Troubles five and six are covered in Par. 5-19.

18. When line locks on first tappet, but does not release by push button 35, bend to the right arm 24, or better still, bend to left crank arm 27. The pin 26 should engage arm 27 so that 26 will extend slightly to the left on back side of 27.

19. There may be times when the bell rings regularly but keys do not lock either first or second time. In this case all this mechanism is in proper adjustment, except that arm 27 is adjusted or bent too far to left, so as to escape and be clear from path of travel of arm 24 through 26. In which case bend 27 into operative position. Remember, if crank arm 27 is too far to right, it will cause lock releasing trouble, if too much to left—none, or intermittent locking. Its position may be determined by lost motion in rocker 28, in which case remove. See that left fore foot does not mash down on 27's adjusting screw. In which case cut foot.

20. Now if keys are partially locked and permit further operation at point set for lock, this shows that rod is not fully thrown under hooks 31. In this case, if other parts are in proper adjustment, adjust crank arm 27 slightly rearwards.

21. In no case ever bend the margin stop rack nor use file on stop or cam 45. The proper adjustment can be secured without resorting to such methods.

22. See that lock rod 29 does not bind on top edge of key

levers 32 from its normal to operative position. Should the margin stop rack not respond quickly from depressed position, increase tension on spring 57 in case other instructions don't hold good.

23. In handling tappet 46a, be careful you do not bind the stud, on the upper part of same, between tappet and front top plate. To bind causes carriage to hang or move slow. If there is much play between the two, it will be shown in the shifting alignment.

24. On the Underwood, the word-space bar is not locked against operation. Even if keys are locked, further depression of S-bar will cause carriage to space to left.

25. If the keys should remain locked when tappets are not in operative position, this shows that rod 29 with its rack has not returned to normal position, caused possibly by tight adjustment of shaft 28, or else by shaft coil spring Q not being operative. In this case look at spring and adjust and give shaft 28 a slight side play.

UNDERWOOD AUTOMATIC RIBBON REVERSE.

(F. No. 23-24-25-26.)

1. Fig. No. 30 shows a perspective rear view of this entire mechanism. The ribbon 1 is wound on spools 2-2, received in cups 3-3, slotted at 3a, the ribbon being equipped near its ends with trips or brass eyelets, passing through slots in cups and threaded through vibrator guide 5. The spools are secured on shafts 6-7, said shafts carrying beveled gears 8-8a, with corresponding gears 9-9a on a crosswise shaft 10, adapted to mesh alternately. This shaft is equipped with a ratchet wheel 24, with handle 25 for winding ribbon at will when desired. A pawl 26 carried by a crank 27, on a rock shaft 28 engages the ratchet, the rock shaft being connected by a crank 29, to an arm 30, which vibrates at all key strokes and transmits through reciprocating pawl 26 a rotary motion to ratchet 24. This arm 30 is an extension of arm No. 43-F. 8.

2. The shaft 10, on which are the feeding gears, is held in operating position by means of a spring detent 31, having a double beveled tooth 32 engaging a double beveled collar 33 fixed on shaft, collar 33 acting against strength of spring D. (See Fig. No. 35.)

3. Swinging arms 11-12 are carried by vertical shafts 13-14 journaled in the frame, the free ends of the arms being forked as at 15 and arranged adjacent to slots 3a in cups to receive

ribbon 1 and to be engaged by trips 4. The shafts 13-14 are also equipped with latches 16, the free ends of which are normally received in notches 17 formed in hub 18, mounted on each spool shaft. These hubs are provided with dogs 19-19a, adapted to swing out and engage a crown wheel 20. These dogs are held normal by the latches 16 when entered in the notches 17; coiled springs 22 on the shafts 13-14 operating to maintain latches in notches 17.

4. The hubs 18 are loose on the spool shafts but are FRICTIONALLY connected therewith by means of friction washers 23, whereby the dogs 19 when released by latches 16, may turn with spool shafts.

5. In operation, when the ribbon has nearly run off one spool, the trip on end of ribbon will engage the forked end of arm 11 or 12, the continued feed of the ribbon, operating to swing the arm against the tension of coiled spring 22 and cause the latch to release the dog which, turning with the spool, is brought into engagement with its crown or ratchet wheel 20 to shift the winding shaft 10 across. The continued rotation of shaft 10, will cause the dog to swing against crown wheel 20, forcing latter laterally, and since it is fast on shaft, this imparts an endwise pull on shaft to disengage gears 8-9 and mesh 8a-9a, thus reversing ribbon travel. Fig. 30″ shows crown wheel in normal position. Fig. 30′ shows position it assumes during the reverse operation by dog 19. This slanting position is made possible by action of spring 37 and serves to relieve any strain incident to the reverse, and thus preventing teeth of pawl 19 and crown 20 from injury.

6. Fig. 35 is a top view of shaft detent 36-38, and with pawl 55 held in normal position by latch 58. Fig. 34 shows the position of the pawl or dog 58 during the reverse operation. When they assume this position, the reverse has been accomplished and both are ready to assume normal position automatically.

7. Fig. 31 shows ribbon cup or spool retainer with knob 21 for swinging it into convenient position to thread ribbon around flanged pully 13, which serves as a guide. The dotted line 1 F. 32 shows method of threading ribbon. NOTE. F. 32 also shows cup in normal position and Fig. 33 swung around shaft 7 by knob 21, being limited in this swing by screw 19 and returned to position by spring 23. Fig. 36 shows side perspective view of spool, shaft, and bearing 17.

8. Returning to the reverse, Fig. 34, you understand, the arm 55 turns about the spool shaft 8, frictionally, and said arm has a tendency to swing around to wheel 56 as long as ribbon

is feeding on opposite spool and which tendency is restrained by latch 58 on shaft 59, carrying arm 45. Shaft 59 is provided with a returning spring 22 (Fig. No. 30.) The hub of pawl 55 is provided with cams or projections 63 upon which the nose of latch 58 rides while the arm 55 is being turned by wheel 56 as in F. 34; said cam 63 swinging said latch in opposition to the tension of spring 22. (Fig. 30.) This spring tends to swing pawl 55 back to normal position away from wheel 56, and does so when the edgewise movement of winding shaft 24 is completed.

9. The movement occasioned by engagement of ribbon trip with arm 12 in slot 15, is only enough to effect the release of pawl 19a at which time pawl continues to revolve by reason of frictional washer until it engages wheel 56 (F. 34). The power supplied by pawl 26-F. 30, causes it to continue revolving, effecting the reverse. This power alone makes possible the reaction on spring 22-F. 30, and the ride of 58 on cam 63.

10. After the release of pawl 19 is made there is no further strain on the ribbon in direction of ribbon travel. The frictional washer also serves to give ribbon enough resistance in winding, to prevent undue slack in same.

11. Fig. 23 shows front view of this mechanism. Fig. 24 shows ribbon spool hook and reversing trip or eyelet 5 in. from end.

RIBBON ADJUSTMENTS (REVERSE).

12. If the ribbon does not reverse, first see if it is equipped with trips 7-F. 23. If not, tie a tight knot in ribbon about six inches from end, but don't twist ribbon. The trip engages the arm 3, and which is the first movement in the reverse.

13. Should it reverse sluggishly, causing an unusually indistinct impression, note the following: If the ribbon is an old, dry, well-used one, this may be expected. The fibre and ink in that part of ribbon that is pounded, when the ribbon is stationary for an instant during the reverse, becomes worn through and ink depleted. (See V. D.)

14. Again the frictional washer 23 may not be tight enough. Tighten same by pressing in on the loop of it, assuming this shape ⧖. Don't spread it too much, as it will bind. Again, the gear with which it contacts 8 or 8a may be raised. This will cause pawls 19-19a to respond quicker, making a shorter reverse.

15. As this operates merely through friction, it is necessary to remove all oil from it. Flush it with pure gasoline.

16. See that the gears mesh properly and remove all lost motion from shaft 10. Push shaft 10 over to left, and to remove L. M. adjust bevel 38 to right. There should be a least bit of play at point of contact of double bevels 38 and 36. See detent arm screw X.

17. Sometimes the detent spring D itself is so strong that the bevel 38 rides with difficulty bevel 36. In this case remove a coil from this spring. (Fig. No. 35.)

18. Trouble is sometimes the result of the ratchet pawls not working properly. See F. 25-25'. F. 25' shows pawls in proper operating position. F 25 shows tendency of feeder pawl 18 to throw check pawl 38 away from ratchet. Sometimes pawl 18 does not revolve ratchet sufficiently to be caught by check 38. Evidenced by slow recovering from reverse. Tighten screw holding pawls on shaft 35.

19. When cup as shown in F. 33 is swung out for insertion of ribbon, it should return by action of spring 23. If it does not, it is evidently binding at its bearing 17. Raise bearing 17 slightly by adjustment of screw under bearing in bracket.

20. See that gears are tight on their shafts. See that arms 11-12, Fig. 30, are contacting with edge of cup and adjacent to pully 13. See that nose of 16 engages deeply 18 in notches 17; that arm 16 is tight on shaft 13-14. Fig. No. 34 shows the position of latch 58 attached to shaft 59, and its relative position to arm 45 of Fig. 34 or 11-12 of Fig. No. 30.

21. Adjust ratchet wheel 24, so that the bushing thereon will be flush with end of shaft 10. See that pulleys 13 revolve freely and that ribbon is on front side of same; that ribbon spools are not too full, as this will cause much trouble; that spool shafts 6-7 have a slight vertical play.

UNDERWOOD RIBBON MECHANISM (ACTUATION)

1. By removing the carriage, you will see this mechanism as shown in Fig. 21 as generally found on this machine, excepting parts 25, 30, 26, 28. R. vibrator 18 carrying R. 10 in upper end, is attached (releasably) to actuating lever 17, pivoted to a bracket at 16, said bracket adjustably attached to Universal frame 13. The vertical extension of lever 17 has a wrist 15 engaging vertical slot in bracket 14 in such a way that the motion imparted to U. Bar 12, by action of typebars thereon, (See Fig. 1-7) actuates lever 17 up and down and thus throwing the ribbon up to receive type impression. The bracket 14 attached to U. frame can be adjusted to vary throw of vibrator 18.

2. Fig. 18 shows the bichrome or 2-color R. attachment. Its use permits the use of two separate colors in printing independently. The actuation of R. is same as Par. above.

3. Ribbon is threaded through Vibrator 4, operated by lever 5, latter pivoted at 6 upon a bracket 7, secured to carriage shift rail 8. Universal bar 9, actuated by typebars, is fixed upon a frame 10, which carries another actuator 11, having one vertical slot 12 to engage wrist 13 on extension of lever 5, and an opposite slot engaging wrist 15 on said lever but nearer to fulcrum 6 of lever. These slots are formed in ears extending forward from body of actuator 11. Actuator 11 is fixed to a bracket 20 (by screw 19 in slot 21) fixed upon U. B. frame, adjustable thereon. At will, either slot may be caused to engage either wrist and thus change from one color to another. This change is done by action of crank arm 22 through lever 17 and rod 23. Now when slot 12 engages wrist 13, lever 5 is given a short stroke, and thus upper half of ribbon is used. However, when slot 14 engages wrist 15, the lever 5 is given a greater stroke or upward movement, throwing R. up much higher than before, thus using lower edge of it, which is usually the red color. Wrists 13-15 then serve as leverage points.

4. The shifting from color to color is done through medium of lever 17, crank arm 22 mounted on rod 23, on forward end of which is fixed cross arm 24, having keys 25-26, depression of which throws color desired into use. This is located on right front of machine, and is mounted on bracket 29 fixed to frame. Arm 24 carries beveled pin 28 projecting rearward and engages a detent 27, which serves to hold arm in shifted position.

5. To bracket 29 is pivoted at 31 an upright arm 32, known as ribbon silencer, which co-operated with pin 28, in bringing arm 24 to a central position. A slot 34 with cam edges 35-36 brings arm 24 to central position, from position shown in F. 17-20 respectively, when switch 32 is thrown to left.

6. The entire mechanism assumes position as shown in Fig. No. 18. This disengages slots 12-15 from wrists 13-14, thus preventing V4 from vibrating by lever 5. The type does not strike ribbon and is ready to cut stencils. (See page 18.) It is locked in this position by detent 37 engaging notches 38-39.

7. Fig. 17 shows position of color switch when lower edge or red is being used. Fig. 20, when upper is used. Lever 32 is in normal position in each figure.

8. Fig. 19 shows lever 5 and lever actuator 11 fixed to controlling bracket 20 attached to U. frame 10. The distance of leverage points 13-15 from fulcrum point 6 is clearly shown.

Slots 12-14 are vertical to permit wrists to change positions, incident to shifting carriage, through medium of center rail 8, which shifts carriage and to which is attached bracket 7.

UNDERWOOD RIBBON TROUBLES—TWO-COLOR ATTACHMENT. (See C. B. Pg. No. 43, Ex. B.)

1. Be sure that width of ribbon used is no more nor less than one-half inch. See that all parts of this mechanism are in proper operating position.

2. It is a well-known fact that when the lower edge is being used, there is an increased heaviness to the TOUCH, due to R. being thrown higher by change of leverage points 13-15. Explain away complaints in like manner. See that there is no lost motion in brackets.

3. In case the upper part of the letters are not printed or are indistinct, see that ribbon is of proper width. If a narrow one is used, this can be overcome by adjusting bracket 20 rearward slightly, but this is not advisable. Change ribbon.

4. If neither color is thrown high enough, remove lost motion and play from controllng brackets 20. Or there may be too much play in slots 12-15 and in bearing of arm 5 pivoted at 6.

5. If both colors throw too high, move bracket 20 forward slightly.

6. Again, to raise or lower one color, grasp back of either wing of bracket 11 with pliers and bend back to raise and forward to lower.

7. If R. vibrator 4 sometimes sticks, see that it is not catching on prongs of V forked clips in front. Again, move the little dust plate back slightly to give more play or you can round off lower corner plate channel through which guide operates. See that guide is bent slightly to the rear at a point about one-quarter inch from where it is attached to lever 5. This curve is absolutely necessary. This may occur when lower edge is in use.

8. Should the vibrator jump off the guide, remove lost motion from brackets or lower this color as in Par. No. 6.

9. If overlapping of colors occurs, see that all parts operate with freedom. That lower is being thrown high enough. That vibrator does not bind on dust shield, etc. Or a change in position of bracket 20 and ear 12-14 may do.

10. The wrists 13-15 should project through slots 12-14 and extend out slightly from sides thereof. This position is determined by adjustment of crank arm 22 on shaft 23. Tighten

same. Get firmly fixed in mind the position as shown in F. 18.

11. The arm 24 should be tightly screwed to shaft 23 on its end and no lost motion therein. Its binding screw should contact with flat surface thereon.

REGULAR RIBBON TROUBLES—(GENERAL).

(Pg. No. 43, Ex. C.)

12. Refer to page 32, and read over R. troubles and R. summary. If vibrator hangs or works sluggishly, remove dirt and gum in its operating channel, Par. 7.

13. Do not attempt to use one-half inch ribbon where 7-16ths is required. If R. cuts off at top, adjust bracket 14 back slightly. This may be due to slot worn in V guide by lower edge of R., which lowers ribbon. Renew or adjust 14.

14. See that R. feed gears are tight on their shafts, and that feed pawls work properly. The catch and check movement should be evident to insure good R. feed.

15. The R. spools should not be too full. This locks action of same, with very poor results. A great deal of trouble is caused by irregular shape and weight of spools, poor ribbon hooks, unevenly placed post holes. The ribbon may bind in cups, causing locked motion, strain on ribbon, hanging of vibrator. Cup should be properly adjusted to bracket so that shafts will turn freely. Be sure that spools are not bent and do not bind in cups.

16. There should be enough tension to ribbon in winding to prevent it from looping behind guide and should be drawn flat. Remove all lost motion or back play to feed pawls or adjust friction washer on (new models) and coil spring on winding shaft (old model).

17. The aligning scales in front should be adjusted slightly away from platen by 1-16th inch. To align scales, write a line across page and adjust scales so that both upper edges will coincide with lower edge of line. Lines on scales should be directly under letters. Scales assume varying positions by adjustment to small support on rear side, resting on machine frame.

UNDERWOOD TABULATOR.

1. This mechanism comprises a rack on which are held stops, said rack pivoted on two projecting arms by pivots 40 F. 50. It is connected with key in the keyboard which, when depressed and released, gives the rack a fore and aft movement.

It is suitably related to carriage to effect a release when key is pressed.

2. Fig. 52 shows rear view of stop teeth 19a which engage rack teeth 17. Fig. 48 shows a perspective side view. Fig. 53 shows a view of this mechanism, as relating to carriage, in normal position. Fig. 54 shows both in operating position.

3. Pt. 35 is letter space rack, engaging pinion 36 of escapement wheel. Said rack is supported by roller 40 attached to lever 38 pivoted at 39 to Esc. bracket. From Tab. rack extends an arm or trip 41, which normally is held away from 38. Thus you see when rack is rocked on pivots 40 this trip bears down on lever 38, which serving as a lever, raises rack 35, disengaging same from pinion and thus allows carriage to jump, and as shown in Fig. No. 54.

4. On rear of carriage 24 is a projection 23, which contacting stop, serves to stop travel of carriage. A leather brake, also in the rear, serves to retard rapid motion of carriage in its jump and reduces vibration. The brake and proper adjustment and handling enable it to be controlled perfectly.

5. The stops are mounted on slide rod 18 of said rack, having scale 16 corresponding with front scale, so that carriage can be brought to a predetermined point by setting stop wherever desired.

6. Rod 18 is grooved 18a-18b, in which engages a ball 24 actuated by spring 22 inside of stop. Stop itself is also capable of a rocking motion, but is held forward for action by spring 22 and angle of 18a.

7. The tabulator rack should be so adjusted on pivots 40, that when it has brought carriage to a stop, it should allow one letter space for the rack 35 to settle in pinion 36. Say the stop is set at point 20 on rack and carriage jumped from extreme right position, by so doing, carriage is brought to point 19 on front scale and when tab. key is released, the carriage should drop to Pt. 20.

8. If not so adjusted, it may settle down, one space to right of 20, or at 19 or one space to left or at 21. This irregularity causes irregular right column margins. In the first case adjust rack to left, second case, to the right.

9. There may be a time when teeth of rack 35 and pinion 36 become broken, due to improper adjustment or manipulation. This will cause carriage to skip a space or so when tabular key is released. In this operation, the trip 41 should depress lever 38 enough to raise rack 35 clear of pinion by 1-16th inch. If rack 35 is allowed to drag on same, broken teeth results. If key is held down only partly, this occurs.

The tabulator key should be depressed firmly and fully and held so until carriage has come to a full stop, at which time release key quickly.

10. Fig. No. 13 shows a top view of lever 38. In this Fig. screw 57 is its pivot. The extension 56 contacts with the tab. trip, 54 is roll on which rack 35 rests and screw 60 serves to lower or raise rack 35. This screw should be adjusted to allow teeth of rack 35 to engage pinion to a depth not less than 1-16th inch.

11. Remove edgewise play from Tab. rack, although it should be free on pivots. This rack is adjusted right or left by screw pivot 40 on left Fig. 50. These pivots are locked in position by set screw. Right one is threaded and thus its position is maintained. Washer thereon distributes shock.

12. The left arm of rack 35 may contact with ratchet wheel and may cause skipping trouble. Contact occurs near pivot of arm. The pivot 40 (left) on wide carriages is eccentric to permit tab. rack to be adjusted nearer to the carriage. Lock nut on pivot. Right pivot is also eccentric. If nose of wheel check 22. F. 14, is worn or is inoperative, the rack 35 will not settle down on pinion squarely and causes carriage to skip.

In Fig. 52, on right end of 13 are two screws used in adjusting rack closer to carriage and thus securing better control. To do so, loosen one on rear and drive in one inside and then tighten rear one.

UNDERWOOD DECIMAL TABULATOR.

(See Fig. 47.)

1. This shows this mechanism as attached to the machine. This particular one is a compound tabulator serving as a regular stop as well as decimal. It is attached under and at the rear of machine and in operation as relating to trip of carriage, is similar to regular tab.

2. Fig. 2 of Fig 47 shows a side view of this releasing and actuating mechanism. The levers 7 pivoted on rod 8 are loosely connected to upright levers 9, so the thrust on keys 1-2-etc., will cause a vertical movement to levers 9. Upper ends of 9 engage stops 19-20-etc. on rack 24 adjustably secured to rear of CARRIAGE.

3. On levers 9 at 38 are cutouts that engage a small universal plate attached to transverse rod 37, which has fixed on its end a governor 44. The right end of rod is connected with the carriage trip arrangement by lever 35 through crank arm 36.

4. Now when keys 1-2-3 etc. are depressed the following takes place: Levers 9 move vertically upwardly, moves plate 39 in same direction and which through crank 36 effects the trip of carriage. Movement of plate also moves governor 44 forward, gear 45 of which engages teeth 46 on drum of spring wheel 28, and which retards rapid motion of carriage.

5. Lever 35 is fixed to the trip lever 32. Keys 1-2-3 may be used for column selecting and 4-5-6 for decimal tabulating. In Fig. 51, Pts. 10 to 15 show the upper ends of levers 9, as connected to keys 1 to 6 respectively. In F. 47, 18 are upright arms for bracing tabulator frame work, etc.

BACK SPACER.

1. This mechanism is located in rear of machine and attached to escapement bracket. It is operated from keyboard by B. S. Key. When operating, it engages the Carriage letter space rack tending to give Carriage a backward thrust.

2. B. S. Key is connected by lever to a rocker shaft, under machine, to which is a crank arm. From this arm is a lever connected with B. S. mechanism pivoted on Esc. bracket. A depression of key rocks shaft and through crank arm, rocks back spacer carrier into operative position. A carrier arm hook, hooks over eccentric pin, said pin serving also as pivot of lever 56 as shown in F. 13, and to limit forward thrust of carrier. Forward movement of carrier operates a wheel check (pivoted on lever 56) which locks Esc. wheel.

3. To carrier is pivoted a pawl that engages rack teeth, said pawl having a check which holds pawl inoperative until it has engaged rack. Being released, it thrusts back carriage. This pawl should engage rack about flush.

4. If wheel check is bent, it will bind on Esc. wheel tooth and lock mechanism. No spacing nor depression of key results. Also the regular escapement wheel check should be operative. (See page 64, Par. 1.) The lever 56 must have free movement.

5. If carriage B. spaces more than once, bend the crank arm down slightly. Again, if it does not back-space at all, remove all lost motion between Esc. wheel and B. S. W. check, or bend up arm crank and turn eccentric forward. No portion of mechanism should contact with rack in normal position. If after releasing B. S. Key it hangs, look to wheel check, perhaps rack is too low, and thus rides point of pawl, perhaps pawl engages rack too deeply, edgewise, or carrier pivots may be

binding, or more tension is needed on this mechanism to return it to normal position.

6. If B. S. Key cannot be depressed, (Par. 4.) it may be caused by tip of pawl striking against rack tooth instead of engaging between them. In this case bend the carrier a little to left, or right, as needed.

BANKING.

(See Figs. No. 14 and 39.)

1. By referring to page 18, the term is explained clearly. Also refer to V. D. Now, when the carriage is returned with ordinary force against the margin stop, the machine should be adjusted as to permit the carriage to settle back one space to left of stop. For instance, if stop is set at point 10 on scale, the carriage, when returned, will pass the 10 Pt. to 9, and when released will settle back to Pt. 10. This is to permit the parts affected in banking to settle with usage to their normal positions. The wheel check 22, F. 14, now comes into use. Its purpose is to prevent a backward rocking of escapement wheel during the carriage return, and allows a regular settling of carriage.

2. See that this check 22 is in operative position contacting wheel tooth on upper side about midway. When normal it should be free from teeth.

3. If the carriage drops back to the left from stop set at 10, inspection may show that nose of check is worn off, or that it is bent out of normal position. In this case renew same or bend it into position. If this is not the case, remove a washer or so from stop slide rack 6, on its end so as to allow carriage a full space to settle in. This rack is No. 6, Fig. 39. Remove washer and tighten lock nut. This adjusts stop further to right.

4. If adjusted too far to right it will allow carriage more than one space for settling, and same may have a tendency to hang up one space to right of 10. In this case move stop to left, putting in extra washer. In doing so the rack 6 must not be turned. Or the release 10, F. 39, may not be engaging stop 9 properly. NEVER USE FILE.

5. If the carriage skips several spaces to left when returned to stop, see that the trip 41-F. 53-54 is adjusted away from contact with lever 38. And that rack meshes with pinion properly.

6. In Fig. No. 39, the collar 38 serves as a limit to the right adjustment of margin stop 8. When properly located and

stop brought against it, the pawl 14 should snap into position on rack 6. If not, it will allow a space and a fraction or not even a space for the carriage to settle in. And for this reason the carriage will hang when returned to extreme right position or it will fall away one space from wherever set. This may be noticeable with stop set in this position, but a change to point say 5, on scale, it is not evidenced. So the setting of collar 38 is important.

7. The indicator extending up from arm 18, line on front scale and pointer on carriage in front of roll 5 should always be in line, when carriage is returned. In changing stop 8 from Pt. '0' to Pt. '5' and same seems locked, the pawl arm 14 is binding in collar 18. Adjust arm 18 to right or file edge of collar.

8. Lever 11 pivoted at 12 has end 10, which, striking point 9, stops right movement of carriage. Depressing right end of 11 enables you to write in left margin. The square-shaped lug now serves to stop carriage to right.

GENERAL NOTES.

1. Fig. 26 shows old rack escapement on old model machine. To remove links 5-F. 1, from machine, first remove bars 2 F. 1 from machine, and then remove bearing shaft X. The middle screw, of the three center screws on right or left of machine frame, must be removed on both sides and bearing X pushed out. The links 5 are numbered to correspond with bars 2 and levers 4.

2. In assembling machine, put oil on edge of Universal bar 6, upper ends of link 5 and stud, and end of bar that fits in segment slot. Reduces friction.

3. The heel 2a on bar 2 should not strike U. bar 6, until bar is about one inch to one and one-quarter inch from platen. U. bar is attached to frame 7, a small extension of which projects through front of segment as a support. The return to normal position of bar and frame is limited by a small adjustable lug on this extension just back of segment. To adjust this lug forward throws U. bar rearward and thus gives better touch. (See page 16, Par. 9.) This change in U. bar alters slightly position of Esc. wheel check 22-F. 14, and ribbon controlling bracket 11, F. 18. Examine this after making change.

4. To prevent small type from perforating paper, pean bar (spread) at point bar strikes segment ring 4′ F. 2.

5. To get at main spring, remove bracket from machine, and

prize out drum crown casing. The end of spring is *releasably* attached to wheel shaft, with little danger of breaking.

6. When the bar 1-F. No. 2 strikes the segment ring 4′ too soon, it can be detected by a sharp metallic ring or flat sound to impact of same. If so adjusted, a rather faint impression results, and it is necessary to strike keys rather hard to cut stencils. It causes a hard jolt at end of key depression, causing fingers to ache. It may be especially noticeable when machine is adjusted for very light action.

7. As you know, this ring is to absorb partly the force of blow from bar to insure uniformity of type impressions. The bar should strike paper on platen and segment ring almost simultaneously, as in Fig. No. 2. If ring first, the platen is adjusted too far rearwardsly. It can be adjusted into proper relation with the ring by eccentrics D, F. 15-16, (which also serves to adjust platen parallel with travel of carriage, when needed). The dotted curves show the position it may be made to assume by adjustment of D. To adjust platen nearer type, loose screw C and turn eccentric D forward, then tighten C. The clutch A′ is part of carriage frame. Through Ecc. D is rod E to ends of which are arms supporting the shifting part of carriage. As the rod E is journaled in eccentric bushing, the movement of latter govern position of carriage with its platen. Eccentric may be adjusted edgewise to remove play in this rocker.

8. In cleaning machine, put about teaspoon of oil in gasoline to lubricate all bearings and give it a shine. In doing so, the machine should be flushed with gasoline.

9. Platen ends should be tight and true. An Elite machine requires a rather hard platen. An Elite will not make good carbon copies. Par. No. 8 and 9 apply to all makes of machines.

10. Add more pressure to front feed rolls to overcome slipping or creeping at bottom of page.

11. The rear feed roll springs should be heavier than front.

12. The U. bar 6, F. 1, should not contact with upper edge of bar hooks. Bars should set squarely over link studs. If not in both cases bars may hang in returning. Dirt and gummed oil will also cause bar to hang or return sluggishly.

ROYAL STANDARD TYPEWRITER.

The Royal is manufactured at Hartford, Conn., and is said to be the invention of Mr. E. B. Hess, one of the most expert

typewriter men in the world. It favors the Underwood in some respects, but has some exclusive and unique features all its own. The 'front aligning scale' S. F. 12, extending entire length of line, serves to align both Capitals and small letters, and adjusting paper, etc. The top dust plates are an effective protection. The margin stops have an adjustable feature F. 25. The so-called 'tensile strain' idea is used throughout in connecting keyboard with operating parts. Eccentric screws are used for making the accurate adjustment. The 'accelerating' typebar principle, in that it causes bars to increase in speed as they near the printing point, is the simplest yet—F. No. 1. It is low and compact, and practically vibrationless. Carriage is slightly longer than others, and is well mounted. The entire carriage with rails and escapement mechanism are tied together and are shifted in like manner. Has rotary roller bearing escapement. The early models were devoid of any attachments selling at $65. Later models have every essential feature for commercial use, such as back-spacer, 2-color ribbon, stencil cutter, improved paper table, etc. Price, $75.

TYPEBAR AND SEGMENT.

All the bars are mounted on a single steel pivot wire H, which is very secure in the cast iron segment. Said rod can be removed so as to take bars J from segment. The bars are almost the same as Underwood, except that they are straight in body and are not so easily removable. It is provided with heel for protecting face of type, and is guided at Prt. Pt. by type guide I, F. 17. This guide is not adjustable, though. The bar bearings, as compared with those of S. P. or Rem., by reason of type guide, extend from pivot of bar in segment to the free end in guide making a bearing as wide as the bar itself is long.

THE ROYAL RIBBON FEEDING MECHANISM.

(Fig. No. 20.)

1. On this machine the ribbon feeding mechanism is extremely simple and easy to understand. Stationed at the rear of the machine, the shaft or rod C′ is geared to the carriage main spring drum A. This arrangement causes the ribbon to move only as the carriage moves. The front end of this driving shaft C terminates in a worm-gear (D). The worm-gear (D) is adapted to engage either of the two gears (G's gear and E) by the manipulation of the lever (F), which lies

immediately behind the left ribbon spool. By turning the lever to the right the worm is thrown upward into engagement with the gear on the left ribbon spool, causing the ribbon to feed toward the left. When the *lever* is turned to the left, the worm is thrown downwardly into engagement with the gear (E) which is mounted on the shaft M, which extends across the machine to the right ribbon spool. When in this position, the ribbon feeds toward the right.

2. When the lever F is in a central position, no feed of the ribbon is effected, and when in this position the ribbon can be removed from the vibrator and led back toward the keyboard and out of the path of the typebars. The machine is then in condition for doing stencil or mimeograph work.

3. 'G' is the ribbon spool shaft on which the ribbon revolves. 'F' is the ribbon reversing handle from right to left, or vice versa. 'H' is the main spring tightning screw. 'A' is the main spring drum. Main spring is contained therein and protected from dust, etc. The rear of face or plate side of drum extends beyond the circumference of drum and whose edge is slotted with small teeth which engage the pinion gear 'B,' and drives the ribbon mechanism. 'B' is the pinion gear which caused shaft 'C' to revolve. 'C' is the rod connecting main spring with ribbon S. shafts. The spring I holds the mechanism in position for feeding the ribbon either right or left.

RIBBON MECHANISM ADJUSTMENT.

1. Only one-half of ribbon is used at a time. To utilize other half, reverse position of spools, rather exchange spool shafts. The left spool winds toward left and right to the right. Fig. 3 shows ribbon vibrator and ribbon threaded therein. It will have a tendency to hang, and not return to normal position, when all the ribbon has been wound on one spool, and is ready to reverse. This serves as a guage in addition to the clicking of handle F. Fig. 20. Fig. No. 7 shows vibrator actuating lever, which is loosely connected with Universal bar. As this bar moves at every depression of key, it must therefore throw ribbon up to printing position. Said lever is pivoted to a bracket attached to lower rail.

2. See that vibrator operates through its channel with freedom, that there is no gum or dust therein, that cotter pins, attaching it to lever, do not bind. If not vibrator will not return from printing to normal position and thus obscure the line.

3. The gear E, F. 20, should engage worm D to the left

slightly. This will prevent any strain and locking incident to ribbon needing to be reversed.

4. In case carriage should hang up and draw band come off wheel A, observe the following: Now, on the feed shaft C is a collar holding pinion B, in position to engage pinion cup. There must be a slight play in this collar. If not, it may lock action of mechanism and cause ribbon to unwind when carriage is being returned for new line. The teeth on wheel drum should mesh with pinion properly. The pinion cup must be tight on shaft C. Its forward edge must not contact with wheel nor its hub with the wheel bracket N. To the forward end of arm J shaft is a crank arm L, which serves as an adjustable bracket for the shifting of worm gear, and in which end of shaft C is journaled. The pinion is free, and the shaft is held against reverse winding by action of a spring on the forward end of shaft in bracket L. This bracket must not bear down on shaft, but shaft should be freely adjusted therein on pivot and engaging hole in end of bracket L, with spring pressing on this pivot. Spring should have good pressure or else shaft C will unwind when carriage returns.

5. Spool shafts G must be adjusted to have a slight up and down play. The gears thereon must be tight. The bearings of arm J should not bind, and spring I must not be too strong. If so, remove a coil. This entire mechanism should work without binding, etc. The cross feed shaft M should have the least side play to permit free movement. Has adjusting collar thereon.

6. With all the ribbon on one spool, the handle F should oscillate, making a clicking sound and should return to normal position. This shows its movement free and that ribbon must be reverse.

THE ROYAL LINE SPACE LEVER ETC.

(Fig. No. 13-14-15-16.)

1. On the Royal the advantage of having the lever on the left hand side of the machine is apparent because when the end of the line has been reached and the carriage returned, the hand then stands directly over the center of the keyboard. This is the case with Monarch, Underwood, etc. Operator finds herself on keyboard quickly. The mechanical construction and principle is correct because the lever works in the same direction that the carriage moves, that is, across the machine.

LINE SPACING MECHANISM.

2. The line space lever A is pivoted in two extensions from C end and is held in normal position by coil spring on lever shaft, inside drum. The short end of A is connected with link B F. 19, other end of which is attached to rocking arm C F. 15-16, upper part of which carries a pawl D, which is caused to engage a ratchet wheel E, attached to platen end. So by moving lever A to right, short arm will draw link rearwards, which in turn rocks arm C and pawl D in same direction. In so doing the nose of pawl engages one of the teeth of ratchet E and causes it to describe a movement according to adjustment of Shield H.

3. The adjustment of shield H by means of stencil numbers thereon, determines how soon pawl shall engage ratchet thus varying movement described. Pawl rides shield to end and then drops and engages ratchet tooth, being limited in rearward movement by eccentric screw R. This movement describes ratchet enough to transfer roll detent S from 1 to 3 notches. This detent holds platen firmly against easy rotation, preventing irregular line spacing. The shield H, swung on platen rod and free to be adjusted, is held in this position by its detent, engaging recesses in shield extension.

4. Fig. 15 shows shield adjusted for 3 space and dotted line shows the end of pawl rearward movement locked by eccentric screw R. Fig. 16 shows it set at zero and for variable spacing. The pawl D drops, engaging ratchet tooth and eccentric R at same time and thus no spacing results from swing of space lever to right. The shield in this position has disengaged detent S and makes platen free to move at will.

5. The spring detent S has a fixed position, and is not adjustable forward or rearward. The precise rotation of platen ratchet incident to line spacing is determined by limited movement of short arm of lever A against stop and by the adjustment of eccentric R. This permits a perfect engagement of detent roll with ratchet at end of lever movement. The roll detent should drop in notch between teeth of ratchet at the same time that pawl strikes eccentric R as in F. 15. If not, the line written will be broken. (See V. D. page 119.)

6. The nose of pawl D is held against shield H by action of spring N, which, when weak or sprung will cause irregular engagement of pawl with ratchet. Pawl should drop in notch directly under end of shield.

7. If lever A does not return to normal position, increase tension of spring on lever shaft by swinging spring

drum to left and tightened. See that rocker arm C does not bind, and if so oil same or else mill off right platen end slightly. Or loosen platen knobs a little.

THE ROYAL PAPER FEEDING MECHANISM.

(Fig. No. 8-9-10-12.)

1. As typewriters are practically the same in their operations, this method of explaining the Royal feed mechanism should lead you to investigate the same arrangements on other machines. The arrangements vary, but the principle involved therein are the same.

2. Fig. No. 8, is a view of this mechanism looking from the bottom of the machine. 'A' is the large main feed roll, which first takes the paper. This feed roll is located up as high as possible so as to take hold of the paper and envelopes quickly and with certainty, and is rather higher than others. This main feed roll 'A' called the rear roll is held in position by a pair of arms 'B' which arms are mounted to swing on the rod 'C.' The arms 'B,' which hold the roll against the cylinder or platen are supported by spring 'D,' and which are fastened to the carriage. These springs have a hole or aperture, intermediate the length of their body through which the adjustment is made by a nut 'E,' to vary their tensions, so that by simply turning the nut 'E,' a greater or less pressure is exerted on the back feed roll. You will notice, its pressure is exerted through its extreme outer end against the arm 'B' as near as possible to the point where the arm 'B' swings on the rod 'C.' It is for this reason that a very little adjustment is required to vary the pressure on the roll.

3. The arrangement of this spring as seen from the side is shown in Fig. No. 9. 'G' represents the three front pressure rolls, which are carried by the arm 'H.' About midway of these arms 'H' are points where they turn on the shaft 'I.' The arms are held by the spring 'J,' shown in Fig. No. 10, which forces the rollers 'G' against the cylinder. The extreme outer ends of all the arms 'B' and 'H' rest on a rod 'K,' which runs through the center of the carriage and which has little flat spots in its body in which the outer ends of the arms 'B' and 'H' rest when the feed rolls are in their normal position. On the outer left hand end of the shaft 'K' is a pinion or gear 'L,' which is operatively connected to the handle 'M' through a gear arrangement in the bottom part of the handle 'M.' This is the paper release lever, and lies toward the back of the machine. When it is drawn forward, the gear 'L' turns the

shaft 'K' around and the flat spots on the shaft 'K' take a different position and cause the arms to be thrown outward and in this way the feed rolls which follow the arms become released from the platen and permit the paper to be adjusted with ease and accuracy in case it is not in straight.

4. Fig. No. 12 illustrates the paper clamping system in use after the paper has been inserted in the machine, and is located above the printing point. 'N' represents both the right and left clamps in which are mounted rubber rollers 'O,' usually termed margin rollers. These clamps are mounted on slides 'Q,' and can be adjusted to accommodate any width of paper by sliding on slide rod 'P.' 'R' is the flat spring behind the clamps which holds them and the roller 'O' against the cylinder and thus holds the paper in position. 'S' is the aligning scale which lies under the end of clamps and extends across the platen.

5. The mode of operation of the paper feeding system of all machines is as follows: When the material is first inserted in the machine, it is taken by the back feed roller A, is forced around the cylinder by its pressure against the platen, and is gripped and fed by the front rollers 'G,' and then passed under the scale 'S'; the clamps 'N' and the rollers 'O.' By the pressure exerted by the different rollers at the several points, it is possible to continue the feed of the paper to its extreme lower edge by any single unit of pressure rolls.

6. The upper edge of the front scale should be in line with the lower edge of printed line being written. Provision is made to throw it up into this position. When releasing the paper by means of the paper release lever, the front aligning scale is thrown up automatically to the proper paper adjustment point. Be careful in the adjustment of this scale that it is far enough below the line to escape the type when printing. When the upper edge of the scale is bruised and battered it shows that the type (small letters) have been striking it. When the scale is raised, it must not contact with margin clamps so that latter will be raised from platen. This scale corresponds with scale on edge of top plates. The feed roll release mechanism is same as the Underwood.

CARRIAGE CONSTRUCTION.

(Fig. No. 29-28-27.)

1. In F. 27, 2 indicates the left C. end plate, and 3 a platen mounted therein. The end plates are connected below the

platen by a transverse bar (upper C rail) 4, underside of which is grooved to accommodate ball bearings, forming only one-half of ball race, other half of which is formed by groove in the carriage shift rail 6. In the ball race so formed are arranged two steel balls 7, encircled by a gear, meshing at the rear with a rack 9, formed in the under face of C upper rail and in front, with a rack 10 formed on the upper face of the C shift rail. By this arrangement, the gears positively space the balls and prevent their displacement. It will be seen that the center of weight of C is directly over the balls, and is evenly balanced.

2. At the rear of platen, between the two C end plates, is a back way rod 12, which is parallel with platen. Rod 12 runs upon a roll 13, held by a bracket 14, and held on opposite side by roll 15, secured in end of supplementary bracket 16 bolted to bracket 14. This rod is directly behind the center of platen, and exactly in the same plane and supplies a solid substantial backing for the type impression and directly in line therewith and thus the alignment is preserved, by preventing carriage from shaking about from impact of type on platen 3. This rod is fitted in end with adjusting collars and should be straight and not bind between rollers 13-15.

3. At each end of the C shift rail, are vertical arms 17 to which are pivoted the front ends of the parallel links 18-19. The rear ends of links 19 are pivoted at 21 with the side plates of machine on eccentric screws. The rear ends of arms 18 are rigidly connected with a rock shaft 20, from which there depends on the left a web or arm 22 having a stud 23 engaged by a shift link 24, operated from keyboard of machine. When the link 24 is drawn forward, the C shift rail 6 is elevated to carry the platen to the upper case position indicated by dotted lines. This upward movement is limited by the stops 25 (adjustable) on the main frame, and the abutments 26 on front of arms 17. The normal position of carriage is determined by set screws 27 in side plates of frame and against these screw tops, rests bottom of C shift rail.

4. The bar bearing rod 38 in segment 37, with bar guide 28, with vibrator 29 riding thereon. The escapement 30, and rocker D, and pinion can be seen better in Fig. No. 1.

5. On the left side there is a projection 34, fastened to left arm 17. This projection operates with a latch 35 in locking carriage and unlocking by link 36.

6. This latch 35 is effective in holding all parts down in normal postion for printing small letters, and contributes greatly in preserving good alignment. In depressing either

shift key on board, this latch is instantly released and C raised to upper position. It is attached to side plate by an eccentric screw for accurate adjustment.

7. The bracket 14 is rigidly mounted in center of C shift rail (under side). In this bracket is pivoted the escapement rocker 31. Its upper end serves as bearing for Esc. wheel 30 shaft and as support for way rod 12. From this it is seen that the Carriage rails and links, with the Esc. mechanism are all tied together in a unit, and the relation between them is positively preserved when in the shifted position.

8. The combind weight of all these parts is counterbalanced by two coiled springs 39, attached to the arm 22, and an adjustment plate X attached to side of frame. This plate is to permit an adjustment so that C will return to rest quickly and relieve heaviness from the shift key. It should be tightly adjusted to side plate. (X-Fig. 26.)

9. The upper and lower rails are held together by adjustable clamps 11, bolted to rail 4, and extending under lower edge of rail 6. Remove lost motion from carriage by adjusting these clamps upward. Should not bind as such will lock movement of carriage to left.

SHIFTING MECHANISM.

(Fig. 21-26-27.)

1. Fig. No. 26 shows this mechanism and its relation to the carriage through link 17 and 10 being extensions of links 36 and 24 respectively of Fig. No. 27. Link 17 is connected to the carriage latch 35 and link 10 to rocker arm at 23.

2. The forward ends of these two links are hooked to an arm 11 extending downward from a rocker shaft 12 turning in bearing in each side plate. This shaft also has a rearwardly extending arm 13 in the rear end of which is pivoted at 13′, the stem or push pin 14 of a carriage shift key 15, located on both sides of board. Now when key is depressed, shaft 12 is rocked, and through arm 11 the links 10 and 17 are drawn forward, one releasing latch 35 and other raising C. Notice that link 17-36 is attached to extreme end of arm 11 and link 10-24 higher up, and that there is some lost motion or slack between the hook of link 24 and the stud 23, over which it loops. This enables the latch 35 to become disengaged before the carriage begins to move upward.

3. In order to shift and lock C in upper position, the shift

lock key is provided. Lower end of stem 19 of this key is pivoted at 20′, to a forwardly projecting lever 20, pivoted at 20″ on right side plate. This lever holds 19 in normal position by action of spring 20^3. Front end of lever 20 is provided with a recess or concave cut-out 21 that co-operates with a projecting pin 22, attached to extreme end of arm 13. Said pin is an eccentric screw.

4. When in normal position, F. No. 26, the lower edge of lever 20 bears down upon pin 22 and when shift lock key is depressed, arm 13 and with it the shift finger key stem 14. is carried downward, rock shaft 12 is rocked and thus links 10-17 drawn forward and C shifted. When the depression of stem 19 is completed, pin 22 passes into notch in end of lever 20 and engages the concave face therein and thus locking mechanism in depressed position and carriage in shifted position, F. 21.

5. To unlock this, only depress either one of the regular shift keys. The effect of such pressure is to impose upon shaft 12 a strain, tending to move it and arm 13 sufficiently to effect a release of notch 21 from the pin 22. at which time the lever 20. through spring 20^3, will assume normal position. Upon releasing the regular shift key the C returns to normal position. (See F. No. 21.)

6. Fig. 21 shows this mechanism in locked position. When C is locked in upper position, there must be no play between the throw limits, that is, projection 26, and adjusting screw 25. Poor alignment results and carriage will have a tendency to drop from upper position while machine is being operated. The pin 22 is eccentric and permits a tight locking of these parts. The link 24 should be adjusted so that when shift key and shift lock key is depressed, the stops 26-25 should contact on both sides. In making this adjustment, see that the Capitals are in align with small letters first, and if eccentric pin 22 is adjusted to raise C high enough.

7. If the moment the shift key is depressed, there is a decided resistance, this shows that latch 35 is holding parts down too tight. Raise latch slightly by its eccentric.

8. To adjust shifting alignment, first remove all lost motion from carriage by adjustment to C clamps 11 and latch 35. Then, if Capitals are lower than small, drive screw stop 25 down slightly. If higher, unscrew and tighten.

9. The links 19 pivoted on eccentric at 21 may be adjusted rearward by eccentric to throw platen nearer type, or vice versa. When is there occasion to do this? (See page 66, Para. 7.)

ROYAL ESCAPEMENT MECHANISM.

(Fig. No. 1-22-23-27.)

1. This mechanism is very similar to the Underwood in construction and operation. Fig. 27 shows its position as relating to the carriage and its bracket 14 is attached to lower rail. The letter space rack meshes with a pinion 32 on Esc. wheel 30, causing same to rotate. In F. 22 this wheel 30 is held against rotating by the pear-shaped roller O, and this is the position of this mechanism at the time the finger key is entirely depressed and about ready to return. You will notice that the loose dog 31 has taken the advanced position ready to receive the next tooth of the Esc. wheel, as soon as the key is released, thus allowing the roll to pass out of engagement and wheel to rotate one space. This roller bearing in a way reduces the load imposed upon the finger in the operation of the keys. Compares with bevel edge of Underwood rigid dog.

2. The Esc. tooth holds normally on point of loose dog 31. Now, when Esc. plate D is rocked, through action of link C on Universal bar X, and plate thereon E, on the trip screw D^1, the loose dog 31, pivoted on Esc. plate D, passes out of engagement with tooth, and the roller O serving as the rigid dog, passes into engagement with the same tooth of the wheel, just before the key has been fully depressed. Just as soon as the keys begin to return, roller O passes out of engagement with tooth and thus permitting a step forward by wheel 30 to be caught by the loose dog 31.

3. The Esc. rocker D, Fig. 22, is well pivoted in bracket and is returned to normal position by adjustable spring 14. F. 27. The set screw 18 serves to limit the throw of this Esc. plate, as does the trip screw D^1. This throw should bring roller O to a position in the middle of tooth and normally the loose 31 should be flush with tooth. This normal position is limited by screw X.

4. The rack should engage the pinion as shown in Fig. 23. The Universal bar X is swung from the rock shaft 20. Fig. 1.

TYPEBAR PRINCIPLE.

(See Fig. No. 1.)

1. Directly under the keyboard is situated the anchor plate. Through slots therein project the key steams L to the ends of which are attached the connecting links O, other end of which connect the typebars J.

2. To this stem L is attached the anchor link M, forward end of which is attached to an ear N, punched from plate. When the key is depressed, lower end of stem L swings down and forward, pulling link O forward, and thus raising the bar J. Near the rear end of link O, the Universal bar links C are attached, and around which are the individual key tension springs. See that the hooks of the U. B. links do not in any way loop around the other.

3. You noticed that the connecting links O were given a pulling force. You will also notice that every movement accomplished from the keyboard is done on this 'tensile strain' principle. It is the simplest way possible to accomplish a movement of any thing and compares with the connecting link or coupler on a train. This anchorage system replaces the regular leverage system on other machines.

CENTER STOP-MARGIN STOPS-TAB. STOPS.

(Figs. No. 2-4-5-6.)

1. The accomplishments of this mechanism is made possible by the center stop 16, F. 4-5, secured to the main frame 18 of machine in rear and which has a fore and aft movement. Mounted thereon is a blade, 15, F. 4-5 and E, F. 2, which cooperates with the regular margin stops C, F. 2, and E, F. 25, in accomplishing the regular line locking as shown in F. 2. The blade 15 is located on the right side of center stop and projects downward. To the lower end of this extension it is connected with crank arms 13-14, pivoted to an abutment from frame (Fig. 6). This crank arm 13 is connected with bar locking gate 11, pivoted directly over the type faces.

2. Now when the motion of Carriage has moved enough to the left to bring right stop against blade 15, said blade is rocked, and through its extension the gate 11 is caused to rock rearward directly over face of type, as shown in F 2. When the margin release key is pressed, the center stop with this blade mounted thereon, is given a fore and aft movement sufficient to release blade 15 from margin stop, at which time the blade 15 and gate 11 assume normal positions by action of spring coiled around gate pivots on new machines or spring attached to gate at 10 and top plate. The line is thus continued a few spaces.

3. The normal position of center stop is such as to be in path of both margin stops. If left stop is against C. S., its position determining the beginning of line, depressing release key also permits writing in the left margin.

4. The center stop 16 is connected with a tabulating key, depression of which causes C. S. with blade thereon to rock a little further rearwards than the M. R. key. The result is that the blade is thrown in the path of tabulator stops, located on a tabulator rack or rail on the extreme rear of carriage, bringing the carriage to a stop after jumping and at the same time locking the keys or line against operation. So in the process of tabulating, the line locks positively every time the carriage is jumped from one colmun to another, no matter how fast same jumps. This prevents operation of letter keys until finger is released from Tab. key, and makes it impossible to write out of the column lines or margins, as the carriage often takes long jumps and rebounds after striking blade, as shown in F. No. 2.

5. The dotted line F. 4, shows normal position of Center stop for effecting regular line lock and margin stop, while E-15 shows same rocked rearward enough to effect release. Fig. 2, dotted lines, shows blade D projected in path of Tabulator stops F. Allow one space for the carriage to settle down to rest when tabulating.

SMITH PREMIER TYPEWRITER.

This machine is unique, in that it is an understroke, has double keyboard, a single type for every typebar and a key for every character. No shifting for Capitals is necessary.

TYPEBAR PRINCIPLE.

(F. No. 1-2-3-5-6-41-43.)

1. The S. P. has a very wide bar bearing, the bearing shaft 4 having a pivot 5 on one end and cone screw 7 socket for holding bar in hanger 20. From pivot end of shaft 4 the bar 10 extends down and in end of which is driven the type. Bearing plate 20-F. 3 is riveted on a ring 1-F. 2-5 and between the forward 3 and rear end 2 of every sixth plate, the bar shaft 4 is pivoted, the ear 3 serving to hold cone screw 7 and ear 2 the pivot 5 on shaft. An ear 3x and 2x extending down serves as bearings for shaft under ring 1 as 4x (dotted line F. 6. You will notice, ears 3-3x are located on outer edge of ring so as to adjust screws. From this end of shaft 4, extends a crank arm 12, with hole therein for attaching a link (11-F. 41). Lower end of this link is attached to crank arm 10 fixed upon a rocker shaft 8, pivoted (forward end) in keyboard plate X and rear end in machine plate F. 21. There are 6 or 7

layers of shafts, each shaft attached to key stem X′ by a crank arm. Stem extends down through plate. Key tension spring is on this end of shaft.

2. F. 43-43′ shows a view of rear ends of shafts 8, with lugs 15 on extreme end thereof and which serve to move a gate 13 (Universal Bar) when shaft 8 is rocked by key depression. Said gate 13 is attached to rear plate by link 14-F 43′ or 70-F. 21 on right and another on left, one end attached to plate X, other to gate 69, permitting same to move to the right as shown by arrow in F. No. 21.

3. To the gate is riveted a locking plate 68 which operates with mechanism in F. 35 in locking movement of gate and keys. To this gate is also an arm 28-F. 41 engaging pin 27 on post 26 and which operates Esc. when shaft 8 is rocked. (F. 42.) The adjustment spring 21-F. 22 attached to left of gate, serves to hold gate normal and governs touch. Now when key X′ is depressed, shaft 8 is rocked, moving gate to right and effecting proper escapement and through link 11, bar 12 is brought to printing position. Releasing key, bar returns by action of gate spring 21, key tension spring, and weight of bar.

CARRIAGE CONSTRUCTION.

(F. No. 10 to 15.)

4. F. 14 shows a side view of Carriage. C 7 is mounted on rail 4, abutting from top plate, and the adjustable front rail 2 (F. 11-12-15) on ball bearing 4-5 moving in a raceway formed by longitudinal grooves in rails and C frame. Midway of frame is mounted a platen and paper feed mechanism, held normal by pitman 11 spring in C end. X-F. 13 shows spring 11 operating channel. By raising lever 19, the platen may be swung forward to inspect writing.

LINE LOCK. (F. 7-8-14-19-21-40.)

5. On rear of C frame is mounted a rack (spacing) 48, underside has teeth 49 engaging pinion gear 50 and thus transmits force of C tension to Esc. wheel 56 through gear 55. In F. 7-8, stops 93 are held normal on this rack by pawl 97 engaging teeth 94 in front edge. By moving pawl forward, stop may be adjusted to any position.

6. A release bar 83 extending across machine and pivoted on rack ends, contacts with nose 82 of a latch 79, pivoted at 81 in swinging post 88. Latch has an arm 80 extending forward through aperture in Esc. bracket 54. Now when end of line is

reached, shoulder 92 of stop 48 swings latch 79 slightly to left, causing post 88 and latch (89-F. 21) on lower end thereof, to swing around and throws hook 90 in path of lock plate 68, thereby locking keys. By striking key 87, F. 14, the latch 78 is raised enough to be disengaged from 92 on stop 48, thus releasing hook 90 and unlocking keys. At any place on line, a full depression of keys 87 will raise latch as shown by dotted line in F. 40. This movement will, through arm 80, raise lever 77, which releases pinion 50 from rack and makes C free to move at will. The pinions 50-55 are mounted on a pinion block and held in operative position by spring 2-F 19.

RIBBON MECHANISM. (F. 14-18-24-31′)

7. Lower half of F. 14 shows a side view of ribbon operation and driving mechanism. F. 18 shows a rear view of main spring and its driving gears, etc. To rear end of wheel 72 short shaft is mounted a set of eliptical gears, which revolve when wheel moves in spacing carriage through action of pawl 112 on ratchet 111. Crank arm 118 attached to one gear is connected with lever 120 which is given a reciprocating movement when wheel moves. Across the machine is pivoted in side plates a rock shaft 122 with arm 121 extending rearwards and arm 123 vertical therefrom, the latter loosely connected with a ribbon spool bracket or carrier 128, in slot 125 in an extension, said carrier mounted on a shaft 137 journaled in machine posts or standards. The arm 121 is attached to lever 120 and its reciprocating movement is imparted thus to rocker shaft and causes an oscillation of ribbon as shown (dotted) in F. 14. This serves to distribute wear on ribbon, reverse same, and feed or wind on spool.

8. In F. 31-31′, R feeding pawls 139-142 are independently attached to machine frame, and one of which takes operative position by rocking shaft 146 through arm 147. This movement holds one normal. Right pawl 142 (dotted) is normal; 139 (dotted) is operative and 139 regular is normal when 142 is operative as shown clearly in F. No. 31-31′.

RIBBON REVERSE MECHANISM.

(Fig. No. 24 to 31′.)

9. The upper ends of pawls 139-142 are reduced to an edge to engage the teeth of crown ratchet 3-F. 24-25 on forward end of R spool hub 32. When spool with ribbon thereon is rocked forward, it operates against a pawl and thus causes an

edgewise pull to R, revolves spool and feeds R. When spool rocks rearward, pawl follows by gravity.

10. In F. 25, across spool carrier is a small shaft 27 to which is riveted a plate 25 with fingers 29 extending therefrom. Shaft 27, with its extension 30, is free to swing when fingers, which ride the R wound on spool, drop into cutouts 8 in spool hub 1.

11. As R winds on right spool, plate 25, riding on coils of R, rises and its arm 30 is gradually swung outward while as R unwinds from left spool, plate 25 gradually drops and arm 30 swings inward towards its working position as in F. 30, until the last coil of R is unwound—when plate 25 rides upon outer core 1 of spool during a partial rotation of latter until fingers drop into openings 8, thus causing arm 30 to swing inwardly bringing tooth 31 into position to catch over the forward edge of pawl extensions 34 as shown in F. 27-29. Said catching movement taking place when spool carrier is at its extreme forward position. In the rear rock of carrier, dotted lines F. 14, tooth 31 pulls pawl 139 rearwardly, thus swinging levers 17-23-F. 28 or levers 147-145-F. 31-31′, to the dotted line position in these figures, which causes left pawl 139 to become operative to feed R on left spool and the right pawl 142 to be inoperative and held so by action of spring 149-F. 31 upon roller 151 inside of left machine plate.

12. The R. winding on Lt. spool (F. 27) causes arm 30 with its tooth 31 to swing outwardly and the Rt. arm 30-F. 27′ to swing gradually inwardly until all R is wound on left spool, at which time the Rt. pawl 142 is caused to be operative and Lt. pawl made normal. The R. clamping device is shown by F. 26-29, which fastens R. tightly to spool hub 1.

TOUCH ADJUSTMENT. (Fig. No. 32 to 39 etc.)

13. As you know the relative position of the U. bar to the key levers or keys determines the TOUCH. On S. P., the U. bar can be shifted to three positions instantly. It comprises an adjustable plate 29, which is caused to move right or left by its engagement with an eccentric turn 35 in slot 36, and adjusted by spring button 37 (see rock rod 45-F. 35). The end of the plate 29 co-operates with an abutment 30 from U. bar or gate 13 and which serves to hold gate in a changed position. In F. 35 (rear view), button 37 is adjusted to extreme left, which causes F. 32 position. If 37 were swung around to engage notch 4, F. 33 position would result. If swung to extreme right in notch 41′, position in F. 34 is taken.

Now the relative position of U. bar or gate 13 to lugs 15 in rock shaft 8, resulting from above adjustments, are shown by Fs. 32′-33′-34′, respectively, causing regular, medium and light TOUCH. The upper dotted line of key 7 in these last Fs. shows its normal position; full line shows the extent of its depression at the time the gate 13 begins to rock; second dotted line shows the further and full depression of key after gate has moved in effecting proper esc. of C. (See page 65, pr. 3.)

14. You will notice that the three positions of plate 29 in Fs. 32-33-34, change the position of or point of contact of dogs 24-25 with Esc. wheel tooth 23. WHY? See F. 41. On line lock rod 45-F. 35 is attached (loosely) an arm 60 (89-F. 21) with hook on end thereof which swings around into path of abutment 30, when latch 50 is swung around incident to line locking, (see page 79), and which locking can occur only when gate is normal or F. 32 position. By pin 44 extending from latch and engaging plate 29 at 47, the plate is caused to become disengaged from lug 30, which moves to Lt. into a locking position. Fig. 36 takes F. 38 position.

RIBBON REVERSE TRI-CHROME R. ATTACHMENT.

(Figs. 45 to 51′.)

15. Fig. 45 shows a side right view, F. 47 a front right view and F. 50, a top perspective view of the entire mechanism. As compared with older mechanism R. spools have a fixed position on shaft 47, oscillating motion is absent. Spools are turned by action of main spring (through pawl 44 on ratchet 42-F. 46) on cross driving shaft 54 with ball ends 55-F. 48: left end 54a and 54b driving left and right spool respectively as shown in F. 50. Spools have plate 130 with fingers 133 as before, riding R. Across base of machine is pivoted a shaft with upwardly extending arms 118-F. 47, with an extension 120 near upper end therefrom, serving as a clutch for a worm gear 112, adjustably fixed on spool shaft. Arms 118 are so arranged to hold one gear into engagement with spool and the other normal, as in F. 50. In operation, R. winds in direction that shaft turns and the opposite spool is free to unwind.

16. In reversing, the arm 133 swings down into engagement with gear 112 which revolving, causes a fore and aft movement to arms 114-118 simultaneously which disengages one worm from spool and engages opposite one.

17. F. 50 shows the R color shifting device as threaded through machine, though not attached to spools. To get a front top view, turn F. 50 upside down. In F. 46′, left pawl 65

engaging ratchet 64, prevents any back play or rotation to R. winding operation.

TWO-COLOR ATTACHMENT. (Fig. 52-56.)

18. This device permits the use of two colors, each one-half of width of entire ribbon, with an oscillation, feed and reverse of each color used. Each color may be shifted into use at will by moving knob 88-F. 52. R. is wound by action of pawls 89 on crown ratchet 91 of spool in its back and forth slide on spool shaft 31. The reversing arm 129-F. 53 operates and pushes against stops 131-132 on arms 113 in effecting the R. reverse.

19. Cross rock shafts 112-94 carry feed pawls and reversing arms respectively. F. 54 shows a rear front view of R. driving mechanism, and F. 56 a top perspective view. F. 55 shows the mechanism for shifting colors into position. When red or rear edge is used, the spools are shifted forward on their shafts and mechanism takes F. 55 position. By this device, the relative position of arm 43 to arm 40 is changed, rather the arc between them is varied, arm 43 is connected with R. oscillating mechanism as in F. 54 and arm 102, with rock shaft 41 as a bearing by its connection with F. 54 mechanism and the R. feed pawls 89, imparts a reciprocating motion to latter, effecting the R. feed.

GENERAL NOTES. (All Figures.)

20. No. 1. In F. 14, one end of C main spring is attached to a hook on hub of ratchet 167 and other end to wheel drum. To increase tension, turn screw 171 to the right. To decrease, vice versa. No. 2. Remove excess play in dog post 63-F. 42 by adjusting screw at base in frame and check nuts at upper end. No. 3. In F. 40, the latch 79 must be raised enough to disengage pinion from rack. If not, rack will drag on pinion, in which case bend up either end of lever 87-F. 14. No. 4. For line space troubles, refer to other mechanisms which are the same in operation. The regulator, with three elevations thereon, limit throw of spacing pawl. L. S. Lever returns to normal position by spring wound on it and located in the lever bearing in C. frame. Oil well. No. 5. Remove lost motion from C. by adjustment on front rail as in F. 10-11-12-15. Loosen screw 8 and drive in screw 7 and then tighten 8. Remove play of platen rack in C. Frame by adjusting platen knob as close up to frame as easy operation will permit. Re-

move edgewise play of platen in rack by putting in washers, etc. See that pitman springs are operative and strong. No. 6. If key top X-F. 41, returns to normal position but bar 12 does not but vibrates and causes other bars to hang on it. link 11 is too short. Lengthen by turning buckle to left. If bar returns normally but key top is not level, link 11 is too long—turn buckle to right. No. 7. If bars hang on the other, they are possibly bent out of alignment. No. 8. If there is intermittent R. feed trouble, see that nose of pawl 112-F. 18 on ratchet 111 is not worn flat and does not slip around over teeth of ratchet and that its spring is operative. No. 9. For banking trouble, remove lost motion from pinions and block F. 19 or renew both. Or tighten spring 2 thereon. Look for broken teeth on pinion or rack and that wheel check X-F. 42 is operative. No. 10. Skipping may result from worn dog points at contacting point with Esc. Wheel. No. 11. C. should be adjusted, so that it will escape rapidly at end of line with medium C. tension. No. 12. If a rough flat wheel sound results from moving C., renew ball bearings 4 and mill out raceway with Emory Triangle (see page 88 T. & M. Catalog). No. 13. See that C. draw band has no crimps in it and that it rides outer edge of wheel drum evenly and does not slip off. Remove lost motion from spring wheel, by adjusting wheel shaft forward. No. 14. Spool shafts on old machines must have a slight play, fore and aft. Remove shafts by releasing spring buttons in forward posts. No. 15. To align may seem hard at first, but to make matters easy consider this, that in order for it to be in align certain bars must be sprung or bent into proper position as they carry the type which make the impression. Take bars at four separate points at equal distances apart—one directly in front of you on forward portion of basket, one on rear and one each on the right and left sides and supposing that all four are out of alignment. If the resulting impression from these four type, is too much to the left of a character in perfect alignment, bend bars to right. If too much to right, bend to left. If too low or below the writing line, bend bar forward toward you. If the impression is above the line, bend bar rearwardly. Keep this in mind at all times. Remove lost motion from bar first by adjustment to cone screw bearing F. 1-2-3 etc. No. 16. Fig. 4 shows feed roll release lever 30—rear roll 22—platen rack 14—pitman hook pin 13—and platen 9. Fig. No. 9 shows rear feed roll tension spring 27 with adjusting screw 28-29, for varying tension thereon. Fig. 16 shows top perspective view of Esc. mechanism. Fig. No. 23, brush E for cleaning face of type. Fig. No. 20, bell

hammer. No. 17. Remove any ribbon strands or ravelings that may accumulate on the R. spool as this will cause R. reversing trouble possibly.

REMINGTON TYPEWRITER (Blind).

1. This machine has the rotary Esc. feature, automatic R reverse and oscillator, billing decimal tabulator, variable line spacer, two-color R etc. Fig. No. 7 shows the paper feeding system. Platen 2, rear feed roll 3, margin clamp 20 and material being fed 36. Pressure on margin clamps may be varied by turning thumb screw 26. The clamp is shown in two pieces in F. No. 8. At point 38 of the clamping device, is pivoted a small front feed roll, not shown.

2. Fig. 11 shows a top view of rear part of machine. The main part of C 8 rides a rail and is further supported by rear rail 34 through arm 33. Directly under rail 34 is loosely pivoted the margin stop rod 1 (with stops thereon) which has a right and left play when required, but held normally to the right. The left stop 17 (shown in detail in F. 14) and right stop 56 is adjusted along the rod. Auxiliary stop 63, shown in detail in F. 13 serves to limit movement of C. Small trip 28 when contacting cam 53 of stop 17 gives the rod 1 a rocking movement and effects the bell ring as shown in F. 12. Further movement of C brings trip 28 against abutment 26 of stop 17 as in F. 9 and moves the rod 1 slightly to the left, and thus ending line and as will be explained locking keys. The trip at this time is shown by dotted lines F. 9. By depressing push button in left top plate a release is effected for an addition. The connection of this button with margin stop rod is shown by F. 16. Rod 12 operating with plate 9 attached to stop rod.

TYPEBAR AND CONNECTIONS. (F. No. 15-19.)

3. The bar 8 is of the pivotal variety (2 bearing pivots) made to swing in hangers 15 arranged in a circle on top plate so that all type strike at a central point. Link 9 connects bar 8 with key lever 10, forward ends of which terminate in the key tops 11 and rear end held in position by guides 8 and a key tension spring 7 against a fulcrum plate 3 in a recess 4 in lever. The bar 8 is swung up to printing position by depressing key 11. The U. bar 12 is located under the levers 10 near rear end thereof and is hung from a bracket 14 by links 13. Bracket 14 is fixed to a Esc. rocker 15 pivoted at 16 in Esc. bracket at rear of machine, and which operates in effecting the

C. escapement when key is depressed. The relation of this rocker, with its parts to C is shown better in F. 4.

4. Fig. No. 19 shows the improved relation between key levers and Esc. rocker. Across front of machine is pivoted a rock shaft 24 with two rearwardly projecting arms 23 on each end and one arm 26 in center projecting down. To lower end of links 19 is fastened by washer 20 the U. bar 18 and upper ends of links are attached to arms 23 at point 22. So to depress the key 6 will give shaft 24 a rocking movement. From a bell-crank 30, pivoted in a bracket 32, extends forward a link 28 and attached to arms 26 of rock shaft 24. A link 34 extends upward and attached to arm 36 of Esc. rocker. Thus through arm 26, the rocking of shaft 24 pulls link 28 forward and rocks the Esc. rocker for effecting the Esc. of C. You will notice that the U. bar 18 is located near forward end of key levers 5 as opposed to F. 15 position. Bar 18 may be moved nearer levers by turning washer 20 as shown in F. 16. The bar takes this position when the keys are locked at end of line. Explained later. Bars 8-13 as shown are located in forward part of bar circle.

LINE LOCK AND ESCAPEMENT MECHANISM.

(F. 1 to 6.)

5. Fig. No. 4 shows a good perspective left side view of this mechanism. To upper arm of rocker 49 is fixed rigid dog plate 48, loose dog 50, and wheel check 162, former two co-operating with Esc. wheel 156 in effecting the step by step movement of C. Esc. wheel 156 is loosely mounted on a shaft 154 which terminated at other end in a pinion 153 which engages a letter rack 7 of the carriage and is thus rotated when released. Set screw X and X′ determine the forward movement and normal position of this rocker respectively. Spring 10 wound around rocker returns same to normal position, and may be adjusted in regulating the touch. See operation of Royal Esc. Fig. 2-3-5 show the improved wheel checks which hold Esc. wheel in position when C is returned from left to right. Fig. 1-2 show inside of Esc. wheel pinion cups attached to rear end of Esc. shaft. Dog plate 48 has a projection 47a which co-operates with an arm 152 (arrester) on margin stop rod in locking rocker and keys at end of line, as shown by dotted lines in F. 6.

6. The improved Esc. mechanism etc. as shown in F. 18-19 and the position of U. bar is such as to eliminate danger of

breaking key levers 5 incident to line locking, straining the links 10, insuring a positive lock for the typebars 13 and a uniform movement of the Esc. rocker in effecting movement of C. Referring to the Esc. rocker, the arms 36-37-84 (one piece) is loosely mounted on bearing shaft 39 and is adjustable thereon by screws 74 and 46 for regulating its relative position. As usual the rocker is held in normal position by a rocker spring, which tends to rock it rearward. The arm 36 is provided with a shoulder 80 in the path of which an arm 81 of bell crank lever 82 extends. As shown in F. 18, this lever is pivoted at 83 to the inside of Esc. bracket 42, and the arm 81 serves as a stop to limit rear rock of rocker through arm 36, and holds same in normal position. The arm 81 is adjustable by thumb screw 95 and held normal by spring 88. The arm 103 extends upward, end of which is provided with adjustable screw 105. Incident to line locking, these arms are given a swinging movement to the left and which releases arm 36 of rocker, the rocker spring becoming effective to move the rocker further rearwardly and thus moving the U. bar up closer to key levers, F. 16. A space or so more to C. brings the arrester (F. 10 attached to stop rod) into the path of the abutment 84, thus locking rocker and keys. The spring pressed arrester 129-F. 10 serves to prevent a blocking of this movement until needed. Fig. No. 1, page 43, shows an enlarged view of rocker and Fig. No. 2, shows rocker locked against operation and the action of lug 135 on stop rod in operating of arm 83 and 81, etc.

RIBBON FEED, OSCILLATION AND REVERSE.

(F. 20 to 33.)

7. The ribbon feed, oscillation and reverse is done by the force exerted indirectly by the main spring. Fig. 27 shows the R spool 85 mounted on a feed shaft 83, rear end of which has a gear 82. Across the rear of machine in brackets from top plate is mounted a cross feed shaft 77 on the ends of which are feed gears 81-78, which mesh with gears 82-79 on the spool shafts alternately. The shaft 77 is caused to revolve by a gear 71 theron being meshed with a gear 68 of a ratchet wheel 69 loosely fixed on main spring wheel X, which, when turning in the spacing of C imparts a rotating movement to shaft 77. When gear 81 is meshed with gear 82 of left S shaft, the mechanism is in position for the R to wind on the left spool while right S is free to unwind. Shaft 77 is held in this position by

action of plunger arrangement 101 as shown in F. 29. When the last coil of R is unwound from right spool a weight 90-F. 27 is released, which by gravity falls and by its crank connection with a pin 93 in end of shaft causes said pin to move rearwards and project out from the face of gear 79 or 82-F. 27. The pin in this position engages a worm gear 95 on shaft 77 and directly in its path which co-operates in pulling the cross shaft 77 from the left to the right position and thus changing the travel of R. The R. spool then winds and left unwinds. F. 27 shows a view of left R spool and shaft. F. 31 a top perspective view of the entire mechanism and F. 33 a rear view of mechanism as placed in machine. F. 28 shows a rear view of reversing pin 93 and arm 89 therefrom.

8. The spools are held in position on shafts by a spool carrier plate as shown in F. 26. This plate is fixed to a carrier bracket 34, which is held in position by two arms or parallel links 42-43-F. 32. The arm 42 has a projecting arm 49 with a roll 51 thereon, which normally contacts with the outer edge of an eccentric plate 36. This plate is a part of the oscillating mechanism as shown in F. 22. In operation, lever 126 is lowered and raised like a pump handle by a lug 125 on the wheel ratchet, said wheel is revolving, such movement causing a gradual revolving of eccentric plate 133-F. 22 through gears 128-130-131, which causes a swinging or oscillating movement to the carrier 34 and thus shifts position of R and R spools along their shafts. F. 20 shows an under view of F. 22. F. 21 shows a side view of F. 22, and Figs. 23-24 show position taken by eccentric in effecting oscillating of carrier 34 through arm 39 or 40.

9. When the 2-color attachment is used the fore and aft movement of R is not so great and the red does not oscillate. A small eccentric is then used as in F. 23-24, and a large one as in F. 30 when solid R is used on regular machine. F. No. 32 shows the red color being used and the carrier in a locked position and arm 49 with roll 51 out of contact with eccentric 36.

10. F. 34 to 39 show the billing tabulator, mode of operation and its relation with the carriage in effecting the proper release and jump. (See page No. 23 and page No. 27.) F 41 shows the tab. key plate with each key numbered. F. 40 shows annular scale for condensed billing. Fig. 42—the line space pawls and regulator. F. 46 shows C shifting arrangement. F. 47-48-50—the variable line space mechanism. F. 51, the C trucks as used on the visible machines and some wide C. Rem. machines.

GENERAL NOTES.

11. If R does not oscillate investigate this mechanism. See that the lever 126-F. 22 is being actuated. See that gear No. 130 is not worn, and that entire mechanism and S shafts are well oiled. No. 1. For banking trouble, remove lost motion in shaft bearing 154, renew shaft, and adjust rack 7-F. 4-11 to the right or left as required. No. 3. F. 43-44 and screws 75 of F. 45 show the limits of the C shift for capitals and normal limit. For shifting alignment make adjustment on these limits, remove lost motion from carriage rail, clamps, etc. The clamps should be removed and holes therein filed oblong so as to allow an upward adjustment of same. No. 4. Remove side play from C rack or frame by adjustment to C rocker pivot screws and adjust the pins 77-F. 45 inward. No. 5. When a key is depressed suddenly and no C spacing results, the U. bar should be adjusted up nearer the levers. It should be adjusted on both sides uniformly so as to give uniform touch on both sides of keyboard. No. 6. Skipping occurs when dog points are worn, not enough tension on Esc. rocker, U. bar not up high enough, and letter space rack 7 does not engage pinion 153-F. 4 deep enough. If too deep, a grating sound will result in C return. Plate X-F. 11 regulates this engagement, adjustable up or down by set screw X′ therein. No. 7. The C should respond quickly when shift key is pressed. Remove play from right key by screw at its rear end. No. 8. Tabulator, F. 36, etc. For operation, see page 23. In the adjusting of the machine for tabulator work, the first step is the placing of the stops 33 on the rack 34 so that the columnar arrangement of figures will fall exactly at the positions at which it is desired to locate them on the paper. The accuracy with which the Tab. has been adjusted can be tested by placing the C at the beginning of the line, the stops being set on rack 34, and then pressing the left push button 1. This will bring the C at a point say 14 on the scales, if stop is set at 15, and when finger is removed, C should settle down at 15. (See Underwood Tab. page No. 60.) The oblong slots in rear end of arms 36, permit the rack 34 to be adjusted as required and held by screw 35.

ALIGNMENT.

12. First adjust the shifting alignment as explained in note No. 3. If the Capital is out, the small letter is likely to be out also. Instead of twisting the bar as with the S. P., it should

be swung around on its hanger binding screw, otherwise the hanger will spread, pivot points may break, and lost motion therein result. Remove all lost motion from the bar by closing in on the hanger and tighten screw. Bar tighteners, sold by part companies, are useful for removing lost motion from bars. See part Catalog. When the impression made by bars in rear or front of bar circle is too much to right or left, they may be swung around into place on their clamp screws. However, with the side bars giving this same trouble, the entire hanger must be moved either to the right or left as required. Say the right bar L makes an impression too near to the preceeding character. The hanger must be moved to the right slightly. You will notice that the bars are curved. Now if the front or rear bars are above or below the writing line, this curve may be decreased or increased as the case may require. Suppose a front bar is above the line. This shows the bar is not reaching the center of the circle and should be either adjusted rearward or the bar lengthened by straightening the curve. Say a rear bar is above the line. It is too long. In this case shorten bar by increasing curve thereto. This bending of bar is done with a bar bender or Nine Prong. Align the small letters first and then the capitals. The type should be driven into end of bar firmly and straight. Keep in mind at all times, when aligning, a perfect center of the bar circle and that all the type must strike at this center to be in perfect alignment. When type are out of align, they are missing this center point. Reason it out in your mind why such and such a change in the position of bar should be made, first, and imagine you see the result of this change before really making same, and be positive you are right.

SMITH PREMIER—No. 10-11.

(C. B. Pg. No. 22.)

1. Fig. No. 11 shows the typebar and principle of this machine, the link 22 making the connection between the bar and the keyboard, such that by depressing key 28 causes a forward pull to link 22 which by its connection with compound links 16-20 causes the bar to move to the printing position. Key tension spring 29 holds same in normal position. The bars have ball bearing cones and which fit in grooves made in a bar shaft extending across the machine, one for the short bars and one for the longer ones. Shown in F. 10-4. F. 7-9 show the cone and F. 10 a screw 9 for tightning same in bar. If this cone were not used, this screw could be used to remove any

lost motion in bearings etc. F. 8 shows an under view of the crank arms attached to key stems. Figs. No. 1-2-5 show views of the line spacing mechanism with all its parts and which does not differ in the least from other line space mechanisms. F. 2 side view, and F. 5 a front view.

2. The carriage, better shown in F. 20, is hung on a steel inclined race way which provides the bearings on which it runs. It travels on twelve 5-16 in. steel balls 6 held in place by two ball retainers each holding six balls for each C rail 7-8. The C. is geared directly to the feeding and driving mechanism through a rack and has no draw band. F. No. 15. The C driving power is conveyed through two geared wheels 13-14, one of which is attached to the C and the other to C and Esc. mechanism at 55.

3. The C may be removed and a wide one used for special work. Remove the clamping screws from the C bed rail 5 and lift off the C together with bed rail 5. You should take care that the small arrangement for relieving the C of the spring tension is operative, which will prevent spring from loosing its pent-up energy and transfers it from the C.

4. The back spacing mechanism reacts on the main spring wheel gear as shown in Fig. No. 22-23.

5. To remove platen, rock it backward, raise the right end slightly, and draw it from the machine. To replace, reverse the operation. Swung from the rear of the C is the swiinging rack which holds the margin stops and the tabular rack. F. No. 25 shows the margin stops on their slide rod and the reversible tab. rack F. 27, rear view, explained later.

RIBBON.

6. The R is reversed automatically, and at will by collar 30-Fig. No. 35, and is C gear driven as shown by F. 33. F. 35 shows the position of the R spools and the R therefrom is threaded up through the machine through a vibrator as shown in F. 21. F. 24 shows the method of attaching the R. to the Spool and held secure by action of a spring therein. The left spool may be removed from the machine, by pulling to the left the spool shaft knob 18, thus releasing the spool and another can now be inserted. Bell mechanism, Fig 29.

ESCAPEMENT MECHANISM. (F. 14-16-17-19-20.)

7. Of the two gear wheels 13-14, loosely mounted on the shaft 48, end of main spring is attached to 14, and the wheel

13 engages a pinion 56. said pinion is capable of being disengaged from gear 13 when required, but held normally by spring 65. Near forward end of shaft 56, is fixed a large worm gear 70, which meshes with a worm 71 fixed upon lower end of a shaft 72 which extends upward toward front of machine and which has a toothed device 73 on upper end for co-operating with feed dogs 90-91. This shaft 72 is held in suitable brackets and well journaled therein.

8. As best shown in F. 17, the rotary toothed device 73 is threaded onto the upper end of shaft 72, having one tooth 87, which co-operates with two Esc. dogs 90-91 in effecting C escapement, said dogs forming part of a rocker 92-F. 17 suitably pivoted. An arm 97 of this rocker is formed at its upper end into a segmental Universal bar or target 100 which is adapted to be struck by contact points 101 on typebars. The rocker 92 and bar 100 are held forward normally against a pin 105 by spring 103-F. 17, coiled around rocker shaft 94, and dogs 90-91 rearwardly, held.

9. The dog 91 is back of and to the left of dog 90, the latter being normally in engagement with the tooth 87 as shown in F. 20-16-17, said dogs being maintained in a fixed relative position. Now as one of the keys is struck, the corresponding typebar, just before it reaches the platen 11-F. 16, strikes the U. bar 100 and rocks the rocker 92 to F. 14 position, thus removing dog 90 from in front of tooth 87 and permits shaft 72 to turn, tooth 87 passing between dog 90 and 91. In F. 18, A shows dogs and tooth 87 top view in normal position. A′ shows position, the instant dogs have been rocked forward effecting release of 87 which is now free to turn. Arrow shows direction of travel.

10. The gearing between shaft 72 and C is such that one complete rotation of said shaft permits the C to be fed one letter space. Now after shaft 72 has completed its rotation, the tooth 87 will strike the left side of dog 91 which has been rocked forwardly into path of tooth 87 which will be arrested by said dog, F. 14, until rocker has returned toward normal position, F. 17, far enough to free said tooth from said dog 91, when it will slide into engagement with dog 90, without affording a further rotation of shaft 72, dog 90 thus holding shaft normally until another actuation of rocker 92.

11. F. 19 shows a front sectional view of this mechanism at about the time typebar has touched bar 100, side view of which, see F. 16. Remember that the tooth 87 holds normally on left side of dog 90 and catches on left side of 91 and is transferred therefrom to dog 90, and that rocker 92 must be rocked

before any C spacing results. In F. 20, arm 118 (dotted) of a rocker 122, pivoted at 121, is connected by link to word space key rocker shaft, extending rearwardly across base of machine and when said key is depressed, the rocker 122 is rocked forward, the end 123 thereof causing a rocking motion to the regular Esc. rocker 92 thus effecting word spacing.

THE S. P. No. 10-11 COLUMN FINDER (PARAGRAPHER) F. 27-31-32-34.

12. This device is operated by the four red keys on the right of the keyboard, F. 34, and its object is to jump the C from its extreme right position to any one of four predetermined points which is advantageous in skipping from one column to another and being able to select the column it is desired to write in and other uses as shown later.

13. The levers 93-96 of the four red keys are pivoted midway of their length and terminate at rear end in varied shaped cams F. 32, which co-operate with a roller 82, fixed on arm 81 of a rocker 78, pivoted on rear of machine frame. The upward movement of cams causes rocker to rock fore and aft and a pawl 50 on upper arm 77 thereof to be projected into the path of stops 1-2-3-4 adjusted on a stop rack 40. Journaled in the swinging rack at back of machine, rear view shown.

14. Each stop is numbered on left face to correspond with the red keys 1-2-3-4, and which represents the column desired and should be placed as shown in F. 27, stop No. 1 being on left of rack 40 and stop No. 4 on right end thereof. You will notice the small projections therefrom on all stops, such as 47 and 48, are differently placed on underside of each stop with recesses between said abutments. Now in operation the varied cams give the rocker 78 a varied rearward movement and the abutments 47-48 and recesses are arranged to be in the path of the dog or pawl. Depressing red key releases pinion 30-F. 33 from gear wheel 18 which permits C to move to the left. If the 1st key were depressed, the pawl 50 is projected into path of abutment 48 of stop No. 1. Returning C to right position and pressing Key No. 2, 50 passes through recess between 47 and 48 of stop 1 and is stopped by lug 47 of 2nd stop, and thus C is brought to a point for writing in 2nd column. 3rd key-50 clears rear of lug 47 stop, passes through recess between 47-48 stop No. 2, and is stopped by lug 47 of stop No. 3, and so on. F. 26-28-30 show cams that effect rock of lug 50 rearwardly. F. 31-32-36 show pawl 50 in operation,

etc., and side views of mechanism. F. 31 left side, 32 right side, and 36 left side views.

15. The stop rack 40 may accommodate two sets of stops for two sets of columns, and may be reversed for same. On this machine, the decimal tabulator works in connection with the column finder, and may be both used at once. For instance it is desired to write $341.42 in the 3rd column. Now by simultaneously pressing the 4th key of the decimal tabulator and the 3rd key of column selector, the C is automatically skipped to the 3rd column in position to write the amount—dollars to the left of decimal point and cents following. Remember the scale on stop rack corresponds with front C scale.

16. In writing in several columns and the C has passed the desired column, say the 2nd column, in which you wish to write, it is not necessary to return the C to the extreme right position and then strike the 2nd column key. Instead you may first press the 2nd key and return the C firmly to the right against the stop, taking care to remove the hand from carriage before releasing the key. It is then in position for the 2nd column. This same operation applies to decimal work in doing continuous work in any single column. For instance I want to write $45.98-234.87-2345.75, and 24.65 in the same column. After the first amount is written, you may depress the proper decimal tab. key as in regular operation and return the C. against the stop which will then be in position for the following amounts, etc.

17. A further use of the Column Selector is as follows: In the body of a letter if same was scaled off as the machine scales, you could have the date at point 50, 'yours truly' at say 35, paragraph indent at 15, and left margin at 10 as usual. In the process of writing, the column selector keys may be used to skip the C to position for these requisites, and thus their relation to each other is uniformly maintained, on the printed page.

REMINGTON—No. 10-11.

1. Fig. No. 5 shows typebar and keylever principle, lever 30 attached to a bell crank in bracket 42 by link 33. Arm 34 of crank is attached to the bar 35 by link 36. The bar 35 is well mounted in pivot bearing hangers 37 secured to the segment 38, so an indirect pull on link 35 resulting from a key 32 depression will draw bar 35 rearward to a printing position, on the platen 11 mounted in C. To arms 27 on ends of a rock shaft 26, pivoted across middle of base, are attached links 28

holding the Universal bar 29. An arm 25 centrally located on shaft 27, by link 24, is connected with the Esc. rocker through arm 2? of it. So that a key 32 depression throws bar to platen and effects Esc. trip simultaneously. Across front of machine is pivoted a line locking gate 44, an edge 47 of which engages a hook 43 on key lever 30 in effecting the locking of keys.

ESCAPEMENT MECHANISM. (F. 3-4-6-14.)

2. The Esc. has only a single dog, 34-F. 6, which co-operates with two Esc. wheels 19-20, the first of which is firmly fixed to shaft 24 by screws 22-23 as in F. 4 and the other is free on the shaft but held rigid to wheel 19 by two screws 25. The relative position of the teeth on these wheels may be changed at will by adjustment of screws 25, so that teeth of 20 will stand ahead of those on 19. This results in a quicker trip of same and gives the Esc. a reverse action. Normally, the action is such that when a key is struck, the dog 34 is released from a tooth in the rear wheel 19 and is brought into contact with next tooth on front wheel 20. As soon as key is released, the dog on rocker goes back to first position, engaging a tooth in rear wheel 19, which allows one space to C, as Esc. rocker and typebar return to normal. The above change in wheels will allow C to escape on up stroke of bar. Understand the rotation is derived by action of C rack 14-F. 5 on a pinion 15 on front end of Esc. wheel shaft.

3. The Esc. rocker as seen in F. 3-14 is pivoted below the Esc. wheels and the single dog is held in upper arm thereof. There are four holes in the forward arm 48 for adjustment of pull wire 50 or say 24 in F. 5, which makes the connection with U. bar. Normally, link 50 is hooked in the 2nd hole from rocker, but to change to either of the others will raise the U. bar slightly and thus cause a quicker response to rocker, etc. This change effects the touch slightly.

4. As better shown in F. 14, the amount of tension on Esc. rocker 20172 is regulated by a coil spring 70, which is secured to rocker and adjusting bridge. To increase tension, loosen set screw X′ which holds adjusting screw X, and turn latter to right, which will lengthen spring 70, until the desired tension is secured. Remember this spring determines the resistance offered by the U. bar 29 to levers 30 when key is struck. In the levers, directly over the U. bar, are adjusting screws which serve to give the Esc. rocker a uniform movement, etc., for all the keys.

GENERAL.

5. The automatic R reverse is duplicated from the blind writer and is identical in operation. The visible machine requires a one-half in. ribbon and thus the spools are not so wide as before. Figs. 13-15-16 show the R feeding and reversing mechanism. F. 17 shows the R vibrator mechanism which is adapted to raise the R vertically to receive type impression. The lower edge is used by using the usual color shift.

6. The C. moves on roller bearings or trucks as shown in F. 51—page 21, which insures long wear and lightness. Same may be removed by first removing rail end plates and pushing out trucks. Thus the C is removed from machine.

7. The variable line space mechanism is as shown in F. 2, is on right of cylinder and is operated by pushing in the right platen knob and can be locked in this position, said motion instantly releasing cylinder from regular space mechanism. The bell ringing and marginal stops and releases are all located at front of the machine. Fig. No. 1 shows a side view of the line space mechanism. The keys 32-F. 5 should be struck and not followed down, otherwise a ghost impression will result. A repulser is provided across front of segment to guard against this tendency.

REMINGTON COLUMN SELECTOR. (Figs. 7 to 12.)

8. This device is such as to enable the operator to jump the C to any one of five different points on the paper by the stroke of one key. Its uses are identical with those of the S. P. No. 10-11. On the Rem. No. 10-11 this device works in conjunction with the regular tabulator rack at rear of machine (17-F.12) and the keys that operate the selector are a part of the regular keyboard. The tab. rack is reversible and can serve for several sets of columns by turning same.

9. A carriage governor 3-F.11, by its connection with the C. spacing rack, prevents any jarring or excess vibration incident to column selecting. When a Col. Sel. key is depressed the lever 62 will be drawn down throwing pinion wheel 2-F.11 into engagement with rack 11-F.12, releasing same from Esc. pinion 12 and thus transmits force of C to governor. The drum 3, of governor contains lead shot through which is caused to rotate a paddle wheel, thus retarding motion of C. The Col. selector mechanism is on the model No. 10, and decimal tabulator on Model No. 11.

10. The column selecting devices comprise an upright rotary shaft 23-F 8 at rear of machine, and which carries at its upper end a multiple stop or star wheel having five teeth, each of which co-act with the tab. stops 18, etc., to arrest the C, the extent of rotation of shaft 23 for this purpose being controlled by selective mechanism connected with lower end of shaft as in F. 8, and operated by a set of selecting keys in the keyboard as shown in F. 10.

11. Fig. 10 shows a side view of the key connection. Selecting key 53 when pressed down swings an angular lever 49, pivoted across the machine base at 52 and by its connection with a link 47, operates the selective mechanism in the rear base of the machine as shown in F. 8, said key and link held normally by spring 57.

12. The link 47 is pivoted to slide bars 45-F.8, which have upper and lower abutments 45a and 45d, said bars being arranged in parallel slots 45c cut in a retaining bracket 35 attached to base of machine through screw holes 36. Depression of key 53 gives link 47 a rearward movement which also moves slide bars 45 rearwardly. The upper abutments 45a thereon causing a rearward movement to the slide plate 40, arranged above the bars in bracket slots 41, said plate being held forward normally by spring 42 at rear edge thereof.

13. The plate 40 has a cut out portion 39, the left side of which opening has a cam edge 39a. In this opening 39 and against the cam edge 39a rests a pin 38 which is fixed on the right end of a rack bar 33 said rack being mounted in a slide way 34, of bracket 35 and is free to slide therein. The teeth of said rack 33 are meshed with a pinion 30 fixed on lower end of shaft 23, which is journaled in bracket 35 at 35b. The normal position of all mentioned parts being shown in F. 8.

14. Now when the universal plate 40 is moved rearward by the slide bar 45, the cam edge 39a thereon, acting on pin 38, causes the bar 33 to move slightly to the right, said movement being sufficient to revolve shaft 23 enough to throw tooth 24a of star wheel 24 into the path of a tabulator stop 18 on rack 17-F. 8.

15. At about this time, the lower abutment 45d of slide bar co-operates with a cross rod 61 of a rocker frame 58-60, said frame moving rearwardly, thus effecting release of carriage, through arm 62 and the link 63 therefrom, its connection with the C being shown in F. 11 and explained in paragraph No. 9.

16. If the C is placed at the extreme right position and the 1st selective key is struck, the tooth 24a of star wheel will be projected into path of stop 18 and be in position to arrest left

movement of C. However, if it is desired to write in the 2nd column and thus depressing the 2nd key, the tooth 24a would take the same position as in the other operation but the stop 18 acting on 24a would cause a further rotation of same until the 2nd tooth 24b is swung to operative position. When key 53 is released spring 57 acts on the key, spring 58-b acts on rocker 58 and the shaft with its star wheel at top and rack bar 33 at base, return by action of spring 32 coiled around the shaft at upper end in a drum as shown in F. No. 7. F. 9′ shows star returning normally after being released. F. 9 shows its engagement with stop 18 when 1st key is pressed. F. 9″ shows its engagement when 4th key is used, tooth 24-d being operative. All top views F. 12-9-9′-9″.

17. The slide bars are so positioned that they serve as a limit to the rightward movement of rack 33 during this operation, intercepting same and thus preventing any further rotation of wheel 24 and permitting it to arrest left movement of carriage.

18. Now to review the operation and suppose the 4th selective key were depressed. Same operates to turn the lever 49, push the link 47 and slide the corresponding slide bar 45 rearwardly. During this movement of the bar, the lug 45-a moves the universal plate 40 rearward from normal position, causing the cam edge 39a thereon, acting on pin 38, to move the rack bar 33 toward the right, thereby rotating and setting the head or star wheel 24 in initial position, in that the tooth 24a will be projected into the path of the stop 18, as shown in F. 9.

There is as will be noticed in F. 8, some lost motion between the rod 61 and the actuating edge 45d of the slide rod 45, and thus during the first part of the initial setting operation, said rod 61 will not be actuated. A further depression of key rocks the rocker of which said rod is a cross rod and thus effects the C trip, as mentioned above.

19. When the 1st stop 18 strikes the selector stop 24a, as shown in F. 9, it causes a partial rotation of the shaft 23 which in turn moves the rack bar 33 one step toward the right and thus the tooth 24b is brought into operative position. One after another the remaining stops 19-20-21 strike the succeeding teeth 24b-24c, etc., and thus the rack bar 33 is moved step by step until its right hand end strikes against the interposed slide bar, which is the 4th slide bar, so that the carriage is arrested by the engagement of the two, preventing further turning of head 24 and causing tooth 24d to arrest C by its contact with stop 21-F. 9″.

20. In order to prevent retraction of the head 24 and rack 33 during the step by step movement of latter to the right during the long run of C from right to left, a pawl 68 (pivoted in bracket at 70, operating in evenly placed notches on upper side of rack bar 33) is used, said pawl being held normally inoperative and brought into operative position automatically as the plate 40 slides rearwards from normal position. The pawl 68 has two teeth or points 68a-68b, the former operating in the notches of the rack 33 and the latter resting on left edge of plate 40 and holding the former normal. It will therefore be seen that as the plate 40 is moved rearward, the pawl by the action of detent spring 71 thereon, is released and moves downward over the beveled edge of plate and thus allows other point 68a to rest upon the rack bar 33 and be in position to engage a notch therein when same is moved to the right. Fig. No. 8′ shows a front view of said pawl 69 at the instant it has been released from plate 40, to engage the notches 33a on upper side of rack 33.

21. The return of plate 40 upon releasing key 53 automatically raises this pawl out of engagement from notch 33a, thus permitting rack 33, shaft 23 and the selective head 24 thereon to return to normal position by action of spring 32 at upper end of shaft 23.

OLIVER TYPEWRITER.

1. The Oliver is a good manifolder. The imprint is obtained by the downward stroke of the U-shaped typebar and is intensified by the tendency of the bar to drop toward the platen, responding to gravity. The bar is double, with a bearing at both sides or ends of the bearing shaft, thus insuring against twisting, etc., as shown in F. 4. the bars being held in position by screw bearing plates at both ends, with adjustable bearing screws therein. The line described by all the type in descending to the printing point is parallel with the printed line, therefore all the type travel in the same circumference. It is the first and only machine to use the U-shaped bar, having the type at the apex or center thereof. The wide bearings are doubly strong and effective in preserving good alignment.

2. The Oliver is not truly a visible machine to the extent that the entire line or all of what has been previously written is not visible at a glance. Carriages of varying sizes may be instantly interchanged provided long rails are there. This allows a great variety of work to be done. It is also provided with a ruling device on the right bar bank which is useful in manuscript work, etc. The C is light and does not require

633878

much tension. It moves on anti-friction travelers that run on guide rails, insuring an easy steady motion. As shown in F. 7 (a left side view) it will be seen that it B^2 is well mounted on travelers b turning on rail A^2 and the rear end of C supported by a smaller rail A^2 on which runs the traveler b^2. Three sets of feed rolls are provided which insure continuously good paper spacing, co-operating with the platen B^1. The C plates are held together by suitable bars, one of which, forwardly placed under the platen (B^3-F7.) has its front face notched. said notches or teeth comprising the letter spacing rack and engaging a pinion A^3 located on upper end of a shaft A^4 of the Esc. wheel A^5. This Esc. wheel is suitably related to the regular dog rocker and other Esc. mechanism as seen in Fgs. 21-22-23 to effect a space of C when a key is depressed. The shaft A^4 is pivoted at lower end in a bracket A^5 and the upper end with pinion thereon is held rearward against and in engagement, normally, with the C rack teeth B^3 by action of a spring a^2. The C release key C^2-F.27 when pressed in moves a releasing plate C-F28 forward, said plate holding pinion in normal position by its contact with roller a^3 thereon, and thus disengages pinion from rack and makes C free to move at will.

3. The Esc. rocker M pivoted at O to a bracket under the machine has a forward arm W^2 to which is pivoted a connecting link W^3, the other end of which is attached to the ribbon actuating mechanism, W. When a key is depressed and released, the forward part of rocker M is given a reciprocating movement which effects the escapement of carriage and simultaneously actuates the ribbon and R carrier through link W^3 rearwardly over the platen to receive the type impression.

4. The typebar is connected with key lever B, by a link F. 17, one end X of same to bar and end X′ to equalizing spring F. 3, said spring being attached to lever by rivets through holes 1 and lever attached at 2. Fig. No. 6 shows same attached and the lever in a full depressed position.

5. The Oliver is a double shift machine in that a separate shift is required for capitals and numerals. The C in normal position always receives the regular small characters. C is shifted forward for numerals, and rearward for capitals. In F. 2 the rod F^3 forming a part of the C rail bed has thereon two sets of check nuts F^2 and f^6, the former limiting the rearward movement of C for capitals and f^6 on the forward shift.

Now if the capitals are below the small letters, adjust F^2 rearward along the rod. The rod F^3 is mounted on a rocker G′ and the rear end thereof is held in place in an adjustable

bracket, rear end of which is seen better in F. 17. All lost motion may be removed therefrom.

6. The R is not automatically reversed, and for this reason very often holes will be punched in the end thereof and will be tightly drawn. This will cause a faint impression. The ribbon should be watched closely and when either spool is full, should be reversed by small knob on the right in front of machine.

LINE SPACING.

7. Fig. No. 16 shows a left side view of this mechanism on end of C. F. No. 29 shows a front perspective view thereof. Plate F. 20 is the line space regulator for 1-2-3 spaces as desired, spring F. 15 holding same in set position, both swung around platen rod R. Hung from rod R is a swinging geared arm S^2, gears of which engage teeth of another swinging arm S^4 pivoted on the C and having link 1 extending under C and contacting with margin stop when operative. In returning C from left to right by pressure on left platen knob, a slight resistance will be felt as it gets within an inch or so from the margin, and it should be pushed beyond this point as this resistance is occasioned by the turning of the platen, otherwise the proper line spacing will not be obtained. A spring detent S^9 engaging notches of a platen ratchet S hold platen in place as spaced, said ratchet S being frictionally connected with platen. A cone F. 10 rigidly mounted on platen rod meshes with the opening seen in S-F. 11, and held thereto by a friction spring X binding on outer edge of the ratchet S, said ratchet being free on platen cone. For varied line spacing without changing position of ratchet, you may hold down, with pressure applied, handle 13, which locks the pawl or detent S^9 in the teeth of the ratchet S. While holding same thus, the platen may be turned with the right hand any desired distance, independently of the ratchet which would also revolve if it were not locked against a rotary motion. On the other hand the handle 13 may be rocked rearward and disengage the detent from the ratchet which permits platen to be revolved at will with the ratchet. This is generally used.

8. It will be observed on the machine as on all others, that in line spacing, that if the detent roll passes over one tooth of ratchet, one space results; over two teeth, a double line space; and over three teeth a triple space.

9. The left platen knob is threaded on the platen rod and held to the left by spring therein. In returning C the knob

and a plunger S′ with a point *s* thereto is moved into engagement with ratchet notches.

10. The C draw band is attached to main spring drum F-8. To remove C from machine, depress C release key C^2 and draw C to extreme left position, and then depress line release key directly in front under R carrier and draw C from rails. The draw band unhooks automatically. Investigate.

11. Either shift key may be locked down by drawing the small lever located between them forward which locks shift key down. To release only depress the lever key as in shifting.

12. The heavy metal locomotive base of the new models prevent vibration and increases stability. Most all the operating mechanism is enclosed in this base and is dust-proof. F. 25 shows screw e^{10} for adjusting tension on front feed rolls, as desired. To remove lost motion from bars adjust bearing screws X in plate as in F. No. 1. Fig. No. 30 shows adjustable plates 14 and 15 on shift key lever and plate I, all on both sides, for removing lost motion from C rail bed, etc. Also see F. No. 17 for rod adjustment.

L. C. SMITH & BROS.

(C. B., Pg. No. 29-43, Fig. No. 19.)

1. On this machine the C is mounted on ball bearings, three serving as a triangular base with two as the top rail bearings. The C is rigid and uniform in motion. The typebars are all ball bearing and in fact the machine is ball bearing throughout in all its operations. The 2-color ribbon is provided for—a shifting device that works so quickly that it could be called the "flying switch," changing from one color to the other by simply shifting a switch lever. In the same way the R can be disengaged for stencil cutting. This device, with the R vibrator is contained in a bracket attached to top plate at the printing point and may be all removed from machine.

2. The paper feeding system is good. It adjusts itself automatically to all kinds of work, made possible by a series of three pressure rolls at the front and four at rear of platen and which are entirely independent of one another, yet work together as a unit. Ten narrow sheets may be fed through one end of platen and a single sheet on the other end.

3. F. 1-2-3 show the line spacing mechanism, which is identical in operation with others. The detent with roll 15 is adjustable vertically. Why? When needed? The pawl 27 in F-3 engages ratchet tooth when line space lever is operated. It is shown before platen has turned and F-2 shows position at

end of pawl travel and platen rotation. The lug 33 therefrom prevents further motion.

4. The New Model L. C. Smith bar bearings comprise a cone containing 15 1-16 in. balls. Part of cone is on the bar and part on the hanger. As seen in F. 10 the bar 3 hanger is attached to a segment which is shifted for capitals. You will notice that the writing point sets back of the perpendicular center of bar bearing and as a matter of course the bars cannot recover from the printing position as quickly as if otherwise arranged. The balls are said to rotate 1 1-4 times in the travel from rest to Prt. Pt. Grit or dust will tend to hang bars from returning and same in this case should be rinsed with gasoline and oil.

5. A link 51 connects bar with a lever X pivoted on a bearing rod 52 extending across machine, lower end of said lever having a roller fixed to it and engaging a cam slot 53 in the key lever 54. In depressing said key lever 54 the lever X is given a rocking motion which pulls link 51 rearward and bar 3 also to the Prt. Pt. on platen 50.

6. When link X rocks rearward, a shoulder 55 thereon contacts with the Universal bar 1, located in path of lever, rocking same rearward and effects the C escapement, by bar 1 connection with Esc. rocker 14 pivoted in rear of machine under Esc. wheel, operation of said Esc. being similar to others. Bar 1 has rear arms 4 on each end attached to arms 5 of a rocker pivoted across the machine and a centrally located arm 10 extending rearward and attached to a central arm 11 of another rocker, said arrangement tending to hold the bar in parallel relation to all shoulders 55, etc.

7. A locking bar 21 is hinged at the rear of arms 4 and 10 and is held up in normal position by the vertical arm of a bell crank lever 25, which engages an arm 21a on end of locking bar. This arm 25 is pivoted to a rigid arm 27 extending from top plate and has an adjustable extension 25b rearward, end of which connects with a link 35, said link being pivoted at 36 to a rocker 37 on top of the machine and on which is placed the margin stops or rod. A coiled spring, as seen in F. 10', tends to hold the arm 25 rearward and normally holds the locking bar 21 against an adjustable stop 29, inoperative.

8. Now in operation, as the carriage brings the lug 41 in contact with the beveled edge of margin stop, the rocker 37 is rocked enough to effect the bell ring and spacing further to the left, the lug 41 engages (F. 8-9) another abutment from stop and causes a greater rock to rocker 37. This, through link 35 swings the arm 25b around on its pivot 26, and the

lever 25 is rocked forward to permit the locking bar 21 to drop by gravity into a position to engage rear edge of arms at 18 and 19, thus locking the rearward movement of U. bar 1 and locking keys against depression. Touching the release key, the rocker 37 takes normal position by gravity and arm 25 returns normally by the spring 28 on pivot 26 and in doing so raises the latch 21 from behind the arms 4-10, thus unlocking keys, etc. Lower end of link 35 is slotted and arm 25b is adjustable to permit a well timed locking movement. Fig. 8-9 show location of lug 41 and manner of engaging margin stop 40. Fig. 10 is a left side view. Fig. 10′ is a top view. F. No. 11 is a top view of bar 1 and locking plate 21. Fig. No. 4 shows a perspective view of the two rockers that hold bar in position. F.-12 shows a front view of the bell ring mechanism. The extension 10-F. 4 is attached to Esc. rocker and thus gives a direct connection between typebars and Esc. mechanism. No 2nd lock to keys on L. C. S.

9. On the front face of Esc. rocker 14-F. 10 (not shown) is adjustably fixed the R actuation lever and the R is caused to reciprocate just as the rocker moves. The fulcrum of the vibrator lever being fixed on underside of top plate.

10. The key lever links X are numbered from R to L 1-2-3, etc., and may all be removed by sliding out rod 52, but first loosening clamp 52′.

The typebar 3 rest pad (leather) 3′ should be kept clean and be renewed sometime. Align bars as on other front stroke machines. To raise both type, lengthen bar. Notice the curve to it? To lower type shorten bar 3. The shifting alignment is regulated by set screws in top plate against which segment strikes and by adjustment to rocker O under segment. In first case above, hanger may be adjusted upward.

11. The touch is regulated by position of Universal bar and adjustment to Esc. rocker spring at rear. The tab. mechanism is such as to prevent any rebound to C incident to tabulating. The C top rail is very accurately adjustable, vertically. On the newer models, a type guide is found. Its advantages were explained before. See Underwood or Royal. A projecting heel from typebar under type locks bar in guide.

RIBBON FEED AND REVERSE.

12. Figs. 13 to 18 cover feeding and reversing. The power necessary to effect the winding of the ribbon and reversal of movement is derived from the spring drum 11 which operates

the carriage. Two ratchet wheels 13-14 and a pinion 15 are rigidly connected together and mounted to rotate on the stud 16, which supports the spring drum. A pawl 17 carried by drum engages ratchet wheel 14 and turns same while C is moving from right to left during the operation of writing and a holding pawl 18 co-operating with the ratchet wheel 13 prevents the pinion 15 moving while C is being returned. The pinion 15 communicates movement through gear 19, worm 20 and worm gear 21 to a shaft 22 arranged at the rear of machine, said shaft communicating a movement to 23-24 through bevel gears thereon. Shafts 23-24 are connected by flexible couplings to shafts sections 25 extending forward under the spools. The end of each shaft 25 is journaled in a small rocker bracket 28 pivoted at 27 and both connected with cross lever 29 on front of the machine, and held in a set position by a detent 30 working in notches 31 thereon.

13. Each of the R spools comprises a hollow cylindrical core 33, an upper flange 34, a lower flange 35 and a flaring or conical skirt 36 below the lower flange. As shown the spool is connected with a sleeve 37 adapted to fit on the upper part of spool shaft 38 both being notched 39 for engagement. Spool is held on shaft by thumb screw 40. Spool shaft extends down and has a gear 43 fixed thereon for R feeding.

14. Adjacent to each spool shaft is a bracket 45, upon it is pivoted a rocker 46, having an upper arm 47 which lies within the core of the spool and carries a roller 48 adapted to bear on the interior of the core when the ribbon surrounds the spool, and to swing outward through an opening 49 in the core when the inner coil of ribbon has been unwound sufficiently to uncover said opening, a light spring 51-F. 6 giving it a tendency to move out through the slot 49 when the R is unwound. F-17 shows the right spool and attachments, and in operation the gear 44 is inoperative while gear on left shaft is winding. When the last coil of ribbon is unwinding from the free spool, as in F. 17, the roller 48 moves outward through the opening 49 as soon as said opening is uncovered, being urged outward by spring 51. The engaging point 53a of the depending arm 53 simultaneously moves in between the teeth of the gear 44. Now as both gears 44 are constantly rotating while R is feeding, the engaging point of the arm 53 finds its way in between the teeth of the free pinion 44 instantly. The continued rotation of the free gear 44 on the right causes it to rise, the point 53a forming a fulcrum about which it rotates. As the pinion rises it carries the free end of the shaft 25 upward as shown in F. 14 position and the bracket 28 toward the center of

the machine. The detent roll 30 shifts from the left notch 32 to the right one and completes the reverse and thus holding in the shifted position, throwing the right gear 44 into engagement with the gear 43 of right spool and the left gears out of engagement with the gear of the left or full spool. The reversal is thus effected while the spools are moving through a small arc and before the last coil of R leaves the empty spool. The R immediately begins to wind on the spool and the roller 48 is withdrawn from the slot and remains within the core of the spool during the winding and unwinding of the R.

15. Fig. No. 13 shows a top view of the feeding mechanism. Fig. 18—a right side view. Fig. 17—a front view of right spool. Fig. 14-15 both front views. In the above operation the R is reversed from the left spool to the R spool, thus changing the direction of travel. When both spools are removed from machine or if there is no R on either spool when in the machine, both of the arms 53 with hooks 53a thereon will be operative to shift its pinion 44 opposing the other and thus locking the mechanism. Be careful as to this.

MONARCH.

1. To produce the best results on this machine, the keys should be struck with a light but quick stroke; said keys should not be followed down in the key depression and the operation of keys should be uniform. If not, the type may make a double impression due to the vibration of the type at the printing point.

2. The typebar 12-F. No. 1, is given an accelerated movement when key X is depressed, said bar, pivotally mounted in a hanger 13 secured to a shifting segment 15 by screw 14, is connected with key lever 4 midway its length through link 11 and a vertical lever or link 8. Said lever 8 is pivoted to the key lever 4 and an opening 9 therein is caused to rock on the cross rod 10, which serving as a fulcrum point, co-operates in causing a rearward movement to upper end of lever 8 when key is depressed, thus bringing the bar 12 to the printing point. You will observe that each typebar has attached to it a small coil spring 12′, other end anchored to hanger, and which is most useful to accelerate the return of the bar from the Prt. Pt. Each key lever 4 has a restoring spring 6 (shown better in F. 3.)

3. At the rear of the machine, directly over the ends of key levers, is a plate 5 known as the Key Lever Fulcrum Plate, said plate co-operating with the bevel edges of lever in vary-

ing touch. Said plate is adjustable nearer or away from levers as desired by thumb screw 48-F 5, said screw being threaded through plate 9-F. 5, and when turned to the right (down) increases and to the left decreases by varying tension of spring 6 and lowering and raising said plate. This adjustment shifts the point of contact between the two, effecting the key depression when lever is swung around at point 53.

4. A universal bracket 39 pivoted across machine under levers 4, carries the U. bar 37 and the end 51 is connected with Esc. Rocker 30 (pivoted at rear of machine) through an adjustable link 48. It will be seen that when a key is depressed the lever 4 will bear down on the U. bar, rocking the rocker 39, causing the Esc. rocker to rock forward effecting the C. Esc. Said Esc. mechanism being similar in construction and operation to others.

5. The link or connection 48 between the Esc. rocker and U. frame is variable or extensible, said link comprising an upper member 41 and lower member 48a and an eccentric or rotary device in the form of a metal disk 55, with two cam or eccentric slots 57-58 therein, all three members being held together in parallel relation by screw and nut 60-61. By loosing said screw, the disk may be raised by handle 59 thereon, thus lengthening the link 48, or if pressed down shortens same. This change does not effect the relative position of U. bar to key levers but rather changes the relation of the link connection with the Esc. rocker. Upper member is attached to rocker arm through slot 44 and if link is lengthened the lip 43 thereon will be raised above the tread 36 of the rocker so that in key depression the rocker will not rock during early part of lever travel. Substantially, as relating to the touch, this change varies the movement of the Esc. rocker by not changing the position of the U. bar, as the case on other machines.

6. A lug 64 adjustably attached to upper member 41 extends forward and co-operates with a swinging arm 66 or 112-F. 6-7 in effecting the line lock at end of line, locking the levers by locking the reciprocating motion of the link 48. F. 7 shows the entire locking mechanism in a normal position and F. 6 in operative position.

7. The carriage, side view as shown in F. 14, is well mounted and is positively and continuously rigid at all positions of travel, light and uniform in movement. Same does not require much tension. The left end of C carries line spacing, releasing, and other mechanism. X shows the line space regulator.

8. Fig. No. 9 shows the margin clamp, adjustable right or left. F. 13 shows a top view of line space mechanism. F. 11

shows the variable spacing mechanism, and F 10 shows a front side perspective view of the platen and spacing mechanisms. Fig. 8 shows a portion of bar as pivoted in the bar hanger.

9. The Monarch Esc. comprises a pivoted dog. Rocker with dogs thereon co-operating with an Esc. wheel and is the same in operation as others. Fig. No. 4 shows a view of Esc. wheel and pinion 32 (like Rem. No. 7, etc). This machine has the reverse feature in that the C will escape during the up stroke of typebar as well as the return of same. The average operator can use the ordinary but for a very fast operator the reverse or "speed" Esc. is used to prevent piling of letters. Fig. 2′, side view of rocker, shows Esc. dogs A-B arranged for ordinary Esc. A is the holding dog, B stepping dog, and C the reverse lever adjustably secured to the dog A by the screw D, the lower end resting upon the lug E. F. 2 shows dogs arranged for speed or reverse movement, and it will be noted that lower end of lever C does not rest on lug E. To change from one adjustment to the other it is only necessary to loosen the screw D and set the lever C as in F. 2′ for ordinary Esc. and as in F. 2 for speed. In either case be sure to tighten the screw. Also F. 4 shows speed operation.

10. For writing on cards or stiff material, set the adjustable margin clamps (F. No. 9) to catch edges of card and add pressure to the card holder or aligning scale by pressing upward the two small fingers projecting forward from a sliding plate. When not in use, same should be normally pressed down. This device is found around the printing point.

11. Figs. No. 15 to 23 show the ribbon mechanism. In placing the R spools (underside shown in Fg. 21) in place, be careful not to exchange their places. They are stamped on bottom side RIGHT and LEFT for the respective sides of the machine. See that the R is threaded through the guides and vibrate properly. The R is automatically reversed and derives its power for feeding and reversing from the C main spring, as does the Rem., L. C. S. & Bros. and others.

12. F. 15-15′ together show the feeding mechanism, being arranged similar to L. C. S. and others though F. 10 shows the device for holding the cross feed shaft 9 in engagement with either spool shaft gear 30. On the ends of shaft 9 are fixed worm gears 44, as on Rem., which co-operate with gravity pawls 45-F. 12 in effecting a shift of position of shaft, said pawls being pivoted above worm and held in normal position by springed rod 53 extending forward and co-operating with devices on R spool and in spool cup.

13. To forward end of rod 53 is an upwardly extending arm

56-F. 12 which engages a small lever pivoted at 60 to top plate at right angles thereto, and in a slot 58 therein. See F 15′-23. The inner end of said lever 59 carrying a small roll 61 thereon and in normal position held toward the center 35 of the spool cup 38. You will notice under each spool a cammed or eccentric latch 64 pivoted thereon at 63 and a spring 65 tending to hold same away from under face. A small hook 68 pivoted at 67-F. 22 extends under said latch and other end being held against spool hub by the coils of ribbon thereon. In operation, said hook holds latch against the lower face of spool above and out of contact with roller 61. When last coil is unwound from spool, the arm 69 is free to rock away from the spool hub and does so by action of spring 65 on the latch, thus releasing the latch which falls down into the same plane as the roller on lever 59. As the spool gradually revolves the eccentric outer edge of the said latch 62-64 will contact with the roller, causing the lever 59 to swing around its pivot 60 and its other end will draw the springed rod 53-F. 12 forward and thus release the pawl 45, which drops into the worm gear 44 and effects the shaft movement. F. 15′ shows position of the spool devices at the time same has released the pawl. Fig. 23 shows position at the end of the spool rotation, limited by the lug 70 on the top plate. Further operation causes reverse movement to spools and devices assume normal positions. Fig. 15′ and 23, showing devices, are top views as seen through spool. Fig. 22 is a side view of spool and devices.

14. Fig. 17-19 show the R actuating devices. To the forward end 56 of lever pivoted on an abutment from top plate at 57, is loosely attached the R vibrator. The rear end 60 of lever is slotted at 59 and in said slot is caused to move fore and aft a pin 63 which is fixed on upper end of link 61 lower end of which being attached to universal frame 29 at 62. Near upper end and immediately to the rear thereof, is a toothless pinion, preferably eccentric though not shown, adjustably fixed upon the cross feed shaft 46 and as shown one side of same is beveled. The rear edge of link 61 contacts pinion which when shifted to the left is disengaged therefrom, but if to the right both engage at larger portion of pinion. As shown in F. 20 the position takes F. 17 position but as shown in F. 18, F. 19 position is taken. This is a shift of link from rear to front part of slot 59 which results in a change from the upper portion of R to lower part, usually red.

15. The improved pinion 68 on new models comprises a series of three eccentrics adjustable on shaft and controlled by a lever in the upper right hand corner of top plate. There are

three notches into which this lever swings. When a single color R is used, the lever should always be in the right hand notch, thus the R is oscillated across its entire width. When a two-color R is used and it is desired to write on the upper half of it, the lever should be in the middle notch. The R oscillates for this half. For writing on the lower edge usually red, the lever should be in the left hand or third notch. This color is also oscillated.

16. You understand in this case the ribbon is fed, actuated, reversed and oscillated. This system insured long ribbon service. You observed that when a solid color R is used it was oscillated its entire width and of a two-color R each half or color was also oscillated only the width of each separate color.

17. In operation the varied eccentrics cause a continual fore and aft movement to link 61 at each rotation of shaft 46. In first case the pin 63 of link 61 is moved back and forth in slot 59 of lever from one end to the other causing a varied actuation to the vibrator with R therein. In second case the pin was rocked in the rear half end of slot and in third case pin was rocked in forward end of slot all of which shows a change in leverage points of the pin.

18. Fig 24 shows C upper and lower rails with bearings therein held in place against displacement by ball retainer 41 a racked edge of which engages a pinion fixed to C frame. The back space mechanism reacts on the Esc. wheel. The segment shift limits are inwardly projecting lugs from the segment standard and adjusted thereon.

FOX TYPEWRITER.

1. In the change from the blind to a visible model, the most important features were retained with other new and useful improvements added. The present visible model has such features as a Removable Platen, F. 1, Interchangeable Carriages, Rotary and Reverse or Speed Esc., F. 13-19, Visibility, Auto. R. Reverse, F. 27-33, very light key action, 2-color R. attachment, and Oscillator F. 35, Double Shifting Segment, F. 6-12, Pivotal Typebars, Adjustable Bar Hanger for removing wear and lost motion, F. 6-12, Card Holder and Aligner and other good adjustable features.

TYPEBAR PRINCIPLE.

2. F. No. 7 shows the bar leverage principle. Forward end of Bar K lies normally on rest pad and other end is pivoted

in usual hanger fixed to segment B. When the key 1 on forward end of aluminum key lever 17, pivoted at rear end at X, is depressed, the crank lever E′ is caused to rock on shaft D, which in turn rocks vertical arm E rearward, upper end of E being connected with typebar K by link J. Thus the bar is swung rearward to the printing point. Releasing key, bar returns by gravity and restoring spring X′ on end of key lever 17.

3. Fig. 6-10-11-12 show views of the bar and hanger and manner of attaching to double segment B. The bars are supported by adjustable hangers M-M′, the folder-over parts of which are held together by adjusting screws X, said hangers facing forward and rearward alternately. You will observe that the hangers of short bars K″ are fixed to the upper section of segment and longer bars to lower section, said sections being held together by several curved arms *b* as in F. 6-12. An arm L′ from segment supports the bar rest L having two sand bags l-l′ for short and long bars.

4. Now the segment B (with hangers, bars and basket), are shifted vertically up and down and is supported by two pairs of links, pivoted in rear of machine frame and extending forward and pivoted to segment B and so connected that when segment is shifted it has a parallel movement, the links maintaining a parallel relation, as on the Royal.

5. Segment B is nicely adjusted in its relations by the adjustable screws *a*-*a′*-*a″* set in a bracket A′ on each side of main frame, F. 10, right rear view, screws *a′* regulating lateral position, *a* normal limit or segment rest, *a″* for limit to shifted motion for Capitals. All these screws are adjusted and retained securely in place by lock nuts.

6. Fig. 9-14. The weight of segment is counter balanced. One of the lower arms or parallel links B′ has a projecting arm B″, rearward, attached by a link through hole O and other end to a lever extending forward and terminating in the shift key. An adjustable screw *b′* co-operates with a loosely mounted worm gear C′ in decreasing or increasing tension of a shift or segment balance spring C″ wound around a cross fixed shaft C, such that a very light touch on shift key will shift segment and bars for Capital impression.

LEVER ADJUSTMENTS, ETC.

7. There are only four bearing points on the Fox Typebar System. There are three individual adjustments on each key lever, one of which regulates the point at which the C escapes (Universal bar adjustment); 2nd, that which regulates the

key dip or depth of key depression; 3d, the key tension and touch, etc.

8. 1st. As you know the relative position of the U bar (with tension thereon) to the key levers determines the movement of the Esc. Rocker in effecting the C Esc. On the Fox, said bar is swung under the key levers by links from the Esc. rocker and is adjustable thereon as with Rem. No. 7. See Para. No. 15, following.

9. 2nd. As you know the bars of a blind machine are distributed around a full circle or given a space of 360 degrees. On a front stroke or visible machine, the bars have to be assembled in an arc of about 175 degrees or less but on the Fox by putting in the double segment, upper-lower sections, an extra 80 degrees is gained, whereby an arc of about 205 degrees is utilized, permitting plenty of room between bars, (compare with Underwood segment), so as to pass each other and permit wide bar bearings.

10. The movement of the bars K-K″ (and their connections) from normal to printing position vary somewhat in extent, depending on their position whether they are in the front or rear hangers or they are side or inner bars, or in the upper or lower section of segment. Because of the difference in lengths of bars K-K″ (see F. 3) and the position of their bearings, although type of each travel through 90 degrees, the type of bar K″ moves through a much greater portion of a circle or an arc of about 125 degrees, and thus you are led to think that the corresponding key lever must be depressed slightly more for such bars in throwing them to printing position.

11. The vertical arms E-F7 vary in height on account of high or low position of bars in segment, said arms or levers all swinging on cross rod D are bent so that their upper ends come into direct line with the bar to which it is coupled and guided there in this relation by a suitable guide.

12. The arm E′ of the levers have in some cases a slot at rear end to accommodate the varied position of a sheet metal lever coupling G-F. 7-40-41. In either case said coupling, held permanent by set screw (*i*), is adjustable back and forth on the key lever 17, thus varying its connection with arm E′ (leverage) and thus the exact throw of the bar is regulated and the movement is limited to exactly the amount required to bring the bar from normal to printing position against the front face of platen, and thus making the key depression uniform for all keys although the travel of bars and type vary. If in depressing a key and the type strikes platen after a very short depression, the slide or coupling should be adjusted rearward. On

the other hand, if same feels rather yielding and long, said coupling must be adjusted forward.

13. 3rd. The rear end of lever 17 is regulated up or down to control its connection with bar lever E′ as shown at X″-F7. Key tension spring X′ is adjustable to in- or decrease tension on any key. Now when the height of said key levers are regulated and varied in this way, it is obvious that their under or lower edges are not parallel or not in same plane across the machine, and if contacting with U. bar would cause a varied movement to Esc. rocker when a series of keys are depressed. To make contacting time of all levers with U. bar uniform, an adjustable metal slide G on each key lever 17, directly above U. bar, is provided, having under portion inclined to correspond to inclined upper surface of U. bar N. The under edge of levers 17 are notched for a short space to be engaged therein by a notched piece in lower part of slide G at *g* and is held up in said position by a spring *g′* acting between top of guide and top edge of key levers. See Fgs. 39-40.

14. It will be observed that by adjusting slide G back and forth along the lever 17, the non-parallelism of the levers is overcome, a regular movement to Esc. rocker is secured and a uniform C Esc. maintained. To adjust too much rearward will cause a greater rock to rocker and a quicker trip to Esc. in proportion to key depression; forward, opposite result. Bear in mind that the U. bar N may be adjusted nearer or away from the slides in regulating the Esc. movement and key action.

ESCAPEMENT MECHANISM.

15. Across the rear of machine is pivoted the Esc. rocker shaft 2, rear view F. 13, with forwardly projecting arms 4 on each end therefrom. To ends of each arm 4-F. 22 is a link 8 connecting same with the U. Bar located under the key levers 17-N-F.40. An adjustable lever 33, adjusted by set screw 35, is connected by a spring 34 to an eyelet in preferably the right link 8 and by this means, the tension of the Esc. rocker and the touch is adjusted, tension being sufficient to regulate both. Drive screw 35 down to increase.

16. In the middle of shaft 2 is secured the Esc. dog block 12 to which both dogs are arranged to co-operate with an Esc. wheel 10, journaled on rear of machine independent of the Esc. rocker, and a pinion 11 thereon engaging the usual C rack 9, side view of each shown in F. 23 and held yieldingly into engagement by a spring 9′.

17. The Fox has the regular and speed or reverse Esc. mechanism. In operation, the dogs are arranged to be shifted in relation to each other in changing from regular to speed and said dogs may be released from the Esc. Wheel to permit C to jump, incident to tabulating, etc.

18. Fig. 13 shows rear view of entire mechanism. F. 15-a front view of dogs on block with levers for shifting. In F. 19, left view, of the two dogs 13-14, 13 may be called the loose or rear dog and 14 the forward or holding dog, both of which are loosely mounted on pivots 18-19 in a cross lever 17, said lever loosely pivoted on pivot 18 which is firmly fixed to dog block 12, such that as in F. 18—the forward dog 14 has a fixed position and dog 13, pivoted on free end of lever 17, is free to move up or down as shown in dotted lines. Both dogs are held toward the other by coil spring 16, separated by stud 15 in block.

19. You will note that the under side of Esc. wheel tooth 10 is square or flat—upper side beveled on both sides. Fig. 19 shows dogs set for regular Esc. The tooth 10 of Esc. wheel (dotted) rests normally on point of dog 14 and which is slightly higher than dog 13. Now in operation, in depressing a key, the shaft 2 is rocked—dog 14 being drawn forward out of engagement with tooth 10, said tooth drops a short distance onto top of dog 13. This brings upper edge of dog 14 slightly above the under square edge of tooth 10 and on releasing key, the dogs rock rearward, 13 releasing and 14 catching the next tooth of the wheel, thus effecting one space.

20. On the other hand, if Esc. is set for speed as shown by dotted line in F. 18 and by F. 16, dog 13 will rest normally higher than dog 14 with its edge above lower edge of tooth 10, such that when key is struck, dog 14 rocks forward out from under tooth 10 and instead of dog 13 being drawn under and engaging the tooth 10, released as before, it will run along the bevel or upper side of tooth, which at this moment rotates, and caught by next tooth on dog 13. Thus the C escapes on the upstroke of the typebars as compared with their return in regular esc.

21. This difference is caused by a change in the relative height or dog 13. Lever 22, having bevel edges 23, when shifted, acts on free end of lever 17, raising dog 13 thereon. Said lever 22 is pivoted to lower end of an operating lever 28 which in turn is pivoted to an extension 26 from block 12 and when thrown to left position, the speed or reverse Esc. results.

22. The lever 29-F.15, pivoted on arm 26, is connected by a

link 31 on left end to the tabulating key, which, when depressed causes the right end of lever 29 (held normal by spring 30) to act on an inclined lug 32 on left face of holding dog 14 and to throw it out of engagement with the Esc. wheel 10, liberating said wheel and thus permitting the C to move freely to some predetermined point, for a column as in tabulating. Contrast this method with usual C rack release.

23. The keys on the Fox should be struck as on the Monarch and Rem. No. 10, and not followed down entirely. If not a ghost impression results from type vibration incident to the rebound from platen.

LINE INDICATOR—CARD HOLDER.

24. Said device is located in front of platen at the Prt. Pt. and in addition to serving to show the exact prt. pt. and line guage, it is to hold the paper against platen. It is most useful for stiff material like cards, and it can be caused to exert a varying pressure on same, holding it more firmly against the cylinder. A small lever under the card holder bracket, when pulled forward, more pressure will result to holder. Normally the lever should be adjusted rearward. Compare this device with Monarch device. The upper edge of this device, serving as an aligning scale, should coincide with ruled line in writing on such.

RIBBON MECHANISM.

25. As stated the Fox R has an oscillating movement as shown in F. 25 across its entire width and same auto. reversed. Fig. 27 shows a front view of R spools and R as seen in the machine. F. 28 a top perspective view of entire mechanism which, with F. 30, showing a rear view of reversing mechanism, comprises the mechanism as found on blind models but the principle etc., of which is still retained by visible models. F. 29 shows a side face view of spool as shown in F. 28. Fgs. 37-33-31 show an improved spool, preferably narrow, to fit a one-half inch R as used on visibles.

26. Referring to F. 29-28, the R spools on each side of machine consists of wooden core L and side metal flanges or end plates '*c*.' A means is provided on core for attaching the R-G. A broad notch '*h*' is provided in core L and pivoted over same is a small lid '*i*', conforming to the periphery of the core. The rock shaft D is pivoted directly under spool shaft and rigidly fixed on it under the R spool is an arm H curved at its upper end to rest against the R wound on spool and passes freely

over it until R is unwound therefrom, when it passes under the lid 'i' throwing it back as shown in F. 29, said arm H swinging slightly into notch 'h' being actuated by a counted weight H' which holds arm H in gentle contact with body of Spool. When last coil is unwound, arm H drops into notch 'h' suddenly and by a tripping arm D', on rear end of rock shaft D, 16-F. 38-X-F-32, this movement effects a trip to the reversing mechanism. The R is guided by a flanged idler wheel or guide roll 'd', pivoted above the spool.

27. The feeding mechanism is similar to the Rem. and others. Each spool is caused to reciprocate on and revolve with their shafts C when actuated by the driving shaft K, which carries bevel gears *a'* at each end oppositely facing and adapted to mesh with gears *a* on ends of spool shaft alternately, to provide a separate winding of each spool. The shaft K is driven by its connection with the main spring wheel—a loosely mounted gear *m"* thereon meshing with gear *o'* carried by shaft *o*, on which shaft is mounted the spring and drum, latter connected to C. Gear *m"* is permanently meshed with gear *o'* and held thus by an extension of shaft *o* acting in an annular groove *n'* in the hub *n* of the gear *m"*. The shaft K is free to reciprocate through this gear *m"* and rotated by its connection through arm *m* and pin *m'*.

28. The rear end of shaft *o* terminates in a small ratchet P' outside of spring drum. In F. 30, R is a double pawl which is forked and embraces both sides of the ratchet P', said pawl being pivoted to end of a sliding lever *M*. The other end of arm M embraces the shaft K loosely and is held neutral by two coil springs *l-l* which also form a longitudinal yielding connection between arm M and shaft K as will follow.

29. Beneath the shaft K is pivoted a rock shaft S, with arms extending from the ends therefrom, said arms S'-T co-operating with the trip arms D'-N in effecting the reverse trip. An arm T' extends down from S on the left (F. 32) and to this connected a spring *u'* which puts tension on same and holds the rock shaft S normally and yieldingly in a central position, so that there is no contact between the arms T-S' and trips N-D'. An arm U-F. 30, provided with weight U' extends rearward from shaft S and a link 'u' extends from said arm upwardly and pivotally connects at *t'* to the pawl R, holding the two jaws of said pawl in normal position equally distant from the ratchet P'.

30. In operation we will say the left spool as shown in Fgs. 28-30 has become unwound, the ribbon G having all wound on right spool. The upper end of arm H is allowed to drop

into the notch '*h*' in the core. This allows the weight H′ to rock the shaft D downward in that direction, the trip arm D′ thereon contacting with arm S′ of the shafts S which is rocked. This movement throws the arm U upward, which through link '*u*' throws lower jaw of the pawl R into engagement with the ratchet P′, said ratchet always turning, throws the pawl and arm M to the left which carries with it the shaft K, also to the left causing the left hand gear *a′* to engage gear *a* and thus wind the R on the left spool changing its travel. You will observe that this reverse was done by the force generated by the main spring, acting through the ratchet P′. When the R is unwound from right spool, the upper jaw of pawl R engages the ratchet. The ratchet P′ and the pawl jaws or teeth are so shaped that when the shifting is accomplished, they disengage automatically, the teeth of the operative jaw moving beyond the range of action of the ratchet P′. Said jaws assume normal position as soon as the trip arm D′ is released.

ACTUATION.

31. The improved spools are shown in Fgs. 37-33-31, F. 33 being a perspective view. The sides or heads of spool are of stamped metal and the barrel or core consists of two incomplete metal drums 4-5 one within the other and adapted to be adjusted one around the other to form a complete cylinder and provide a means of attaching R. A slot 12 is through outer drum 4, whereby by rotating metal ends 3 in opposite directions, the slot is opened or closed, clamping R therein. The position and action of weighted arm 14 is the same as before except that the upper ends drop into an opening in barrel of spool after the last coil of R has released a lid 8, weighted at 8′-F.37 and as shown the R is being reversed.

32. A face eccentric cam 17 of sheet metal is clamped on the forward head of spool and serves by suitable connections to operate a movable R guide to oscillate same. Fig. 7 shows side view and F 35 a side view of the means of actuating the R. A rock shaft 14 is pivoted across machine at base having rearward arms 14′, ends of which are through link 15 attached to a secondary U. bar 16 under key levers 17 and actuated thereby. From left end of shaft 14 on left end, extends vertically a flexible arm 18 which acts on a depending arm 13 from cross rocker 10, said rocker carrying at central point the R vibrator or carrier C-F.27-27′.

33. When a key is struck, lever 17 acting on bar 16, causes 18 to rock rearward which also moves arm 13 rearward

causing Vibrator to operate. The movement of arm 13 is limited and varied by nut 21 in pivoted abutment 21′ and acted upon by cam 17. It will be seen that as R spool with cam thereon rotates with its shaft 2, the abutment 21′ will be swung back and forth through its relation with cam and that as arm 18 is yielding, the movement of V and arm 13 will be varied by positions of 21′ which will secure the desired oscillation to the ribbon.

GENERAL NOTES.

34. F. 34 shows side view of old C construction. F. 42 rear view of same, showing line lock, bell and margin stop arrangement. F. 4 shows rear bed rail and means of attaching C thereto, and ball bearing retainer. F. 1 shows end of new C construction. F. 2 platen detent, and ratchet device. F. 36 top of right end with line space mechanism, and removable platen feature X regulator for line spacing—H—the clamps that hold plate in C.

35. The C is well mounted on ball bearings—L′-F.5 showing front ball retainer. The rear bed rail is fixed to machine as shown in F. 20 by pivot screw *a*″—C being held in place on rails by front pointer A-F.1 and clamping rollers V′ on each end and 76 in middle, all of which must be loosened when removing C.

36. The lever F-F 2 when pulled forward one notch, releases the detent E′ from ratchet C″. If two notches, throws on platen brake G′ as desire.

37. The R oscillating movement is governed by nickel plated knob on left of machine. To disconnect Osc. movement when using two color R, turn knob toward front of machine. Turn rearward to make operative the cam. To print red, press down red button. To cut stencils, press in button on front of machine at left which disengages R from actuation.

PRINTED RESULTS—VISIBLE DEFECTS.

The printed result is virtually controlled by three mechanical features—typebar, carriage, and escapement mechanism. The printed result will reveal a great many defects, rather needs of adjustment if there are any and perfection in the adjustment of every mechanism contributes to perfect results.

INDEX TO PRINTED RESULTS—Pg. 39-43.

1—Perfect side and shifting alignment.
2—Banking troubles. See pg. 18, Pr. 13; 64-84, note 9; 89, note 1.
3—Tracking trouble, pg. 14, pr. 5; 46, pr. 1-10.
4—Imperfect Line Spacing, pg. 15, pr. 8; 31, pr. 3; 36, pr. 3; 46, pr. 1-10.
5—Blurred, double imprint, 37, pr. 2; 96, pr. 7; 106, pr. 1; 115, pr. 23; 43, pr. 11.
6—Line locking trouble, 20, pr. 3; 52, pr. 13; 77, pr. 1-5; 79, pr. 5-6; 86, pr. 5-6; 94, pr. 1; 103, pr. 5-8; 107, pr. 6.
7—Ribbon reverse trouble, 32, pr. 2; 33, pr. 4; 35, pr. 3; 54, pr. 1-11; 56, pr. 12-21; 60, pr. 15; 85, note 17; 101, pr. 6.
8—Intermittent ribbon feed, 32, pr. 2; 34, pr. 1; 60, pr. 14-15; 84, note 8.
9—Oil on ribbon, 35, pr. 4 (Type filling).
10—Slow ribbon reverse, See No. 7.
11—Writing on line, 20, pr. 6; 48, pr. 10; 71, pr. 3; 108, pr. 10; 115, pr. 25; 60, pr. 17; A, pg. 43, C. B.
12—Poor Manifolding alignment, see pg. 19, pr. 16.
13—Manifolding alignment, see pg. 19, pr. 16.
14—Perfect tabulating, 23-27; 60, pr. 1-12; 89, note No. 8.
15—Irregular tabulating, 23-27; 60, pr. 1-12; 89, note No. 8.
16—Imperfect shifting alignment, 15, pr. 7; 44, pr. 2-3; 49, pr. 7; 73, pr. 3-6-9; 89, pr. 12; 100, pr. 5; 104, pr. 10; 110, pr. 18; 111, pr. 5.
17—Carriage skipping, 16, pr. 10; 42, pr. 4-12; 61, pr. 2; 84, note No. 9-10; 89, note No. 6.
18—Fresh ribbon impression, 33, pr. 5-8; 30, pr. 2-3.
19—Defective battered type face, 30, pr. 2; 39, pr. 6; 67, typebar-segment.
20—Letters cut off, 59, pr. 4-9; 60, pr. 13; 59, pr. 1-3.
21—Poor alignment (side), 14, pr. 2-3; 17, pr. 12; 30, pr. 2; 40, pr. 1-4; 42, pr. 4-12; 43, pr. 1; 37, pr. 2; 89, note 4, pr. 12; 108, pr. 9; 114, pr. 17-23.

22—Very poor alignment, see No. 21.
23—Good carbon impression, 36, pr. 1-6.
24—Type and typebar twisted, 39, pr. 6; 44, pr. 1; 89, pr. 12.
25—Defective spacing, 49, pr. 5-6; 70, pr. 3; 83, note No. 4; 102, pr. 3.
26—Carriage hangs, piles, etc., 43, pr. 10; 52, pr. 12; 42, pr. 5; 43, pr. 1; 76, pr. 3; 89, note No. 5; 108, pr. 9; 114, pr. 17.
27—Defective type, see No. 19.

A—Pg. 43, shows exact way to use aligning scales.
B—Pg. 43, shows various points that type may strike a (half-inch) 2-color ribbon. See pg. 33, pr. No. 7.
C—Pg. 43, shows the various points that type may strike seven-sixteenths-inch ribbon. See pg. 33, pr. No. 7.

B.

No. 1—Shows proper point type should strike ribbon on both upper and lower edges.
No. 2—Ribbon throws too high. Overlapping of colors occurs on upper edge. Pg. 59, par. 5-9.
No. 3—Ribbon doesn't throw high enough. Letters cut off at top, colors overlap on lower edge. See pg. 59, par. 4-9.
No. 4—Shows varied points, although giving good results See pg. 59, par. No. 8.
No. 5—Holes or well pounded point that will appear, caused by not reversing or slow Auto. reverse. See pg. 56, pr. 12-13.

C.

No. 6—Shows proper point type should strike seven-sixteenths inch ribbon on upper half.
No. 7—Ribbon doesn't throw high enough. Cuts off at top. See pg. 60, par. 13.
No. 8—Type strike in middle of ribbon with no advantage in reversing spools. Throws too high. Adjust bracket forward.
No. 9—Shows points type strike a seven-sixteenths inch ribbon when a half-inch R. is required. See pg. 59, par. 1-3.

GENERAL NOTES.

1. The shoes or heels of the Underwood or Royal typebars must be adjusted so that they will strike straight through the typebar guide without rubbing on either side. The bar should fix snugly in the slot of the guide with the least bit of play on either side.

2. Next to the relative position of U-bar to the typebar or key-lever, the tension operating on said U-bar or dog and escapement rocker determines the touch.

3. If the letter spacing rack engages the Esc. wheel pinion too deeply, it will be accompanied by a grating, grinding sound when carriage is returned from left to right.

4. The Fox bar bearing is seven-sixteenths of an inch wide, and the bar hanger is made adjustable to take up wear or lost motion in the bar.

5. No line locking occurs on Underwood, either first or second time, when locking rod and the rack have swung too far rearward through looseness of collar 4, Fig. No. 46. This position does not allow arm 24 to move crank arm 27 as same is out of the path of arm 24.

6. See Und. Fig. No. 29. Normally there is some lost motion between vertical arm 15 and the rocket bracket 3 to permit C. to be unlocked before same is shifted for Capitals.

DIAMETERS OF PLATENS.

7. Underwood, Remington No. 7, Smith Premier No. 10, Monarch, Fox Visible, one and three-quarter inches; Oliver, one and three-eighths inch; L. C. Smith, one and five-eighths inch; Remington No. 10, one and one-half inch; Royal, one and one-half inch.

8. This diameter is the direct distance through the center from one side to the other, while cylinder is on the core. Measure with outside calipers. Diameters should not exceed the above.

9. Keep track of the machines by their serial numbers.

10—On Royal lower rail are two small arrows that indicate the distance the ball and pinion should be spaced apart.

11. In article on Touch Theory, what did the adjuster do? What exact changes did he make? Apply this theory to all machines.

12. See pg. 66, paragraph No. 8-9.

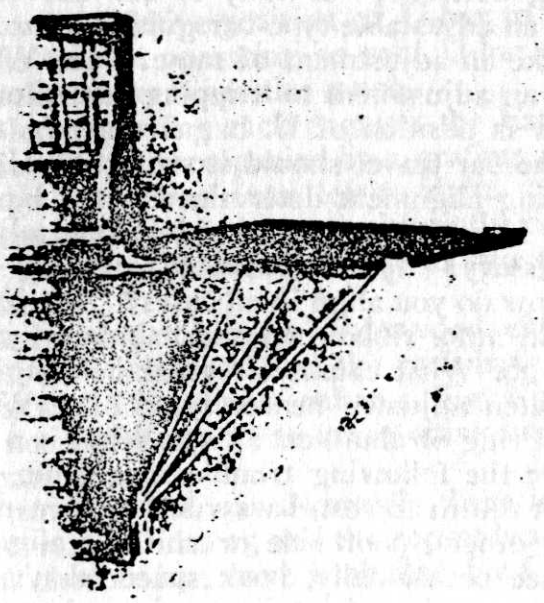
UNDERWOOD QUESTIONS. (See Cut Book.)

1. How does position of U. bar differ from that of other machines? 2. What advantage has the key tension? 3. What is the real purpose of the Esc. mechanism? 4. How does it operate? 5. What are the dogs? 6. How many bearing points has the bar mechanism? 7. How is the face of type protected from being battered? 8. Why is bar curved? 9. What advantage has an adjustable type-bar guide? 10. When is it necessary to make an adjustment of same? 11. When is it necessary to make an adjustment to 'tripping screw' on Esc. dog plate? 12. How is position of U. bar changed? 13. At what point during the bar travel should it strike the U. Bar? 14. How is the shifting alignment determined? 15. How are links removed? 16. How is tension on feed rolls adjusted. and when is it necessary? 17. How should aligning scales be adjusted? 18. How do you align in all cases? 19. Explain operation of line-lock, auto. ribbon reverse, tabulator, 2-color R. attachment, etc. 20. What causes irregular banking? 21. Why and how is platen adjusted nearer type? 22. What is object of the segment ring or abutment? 23. What is a wheel check? 24. How are the following troubles overcome—type-bars hang and do not return to rest, bars vibrate when returning to rest, hanging others, poor side or shifting alignment, carriage skips a space occasionally, back spacer don't work, heavy touch, poor line spacing, faint impression, slow ribbon reverse, bars hang in guide. 25. Is the relation of the typebar to the escapement mechanism direct or indirect?

ROYAL QUESTIONS.

1. Explain the 'tensile strain' idea as applied to the Royal. 2. What is the 'accelerating' typebar movement? 3. How derived? 4. How is the ribbon mechanism driven? 5. Explain the paper feeding and line spacing. 6. What is the object of the platen ratchet detent? 7. How does the carriage construction differ from other machines? 8. Explain operation of Carriage shifting mechanism. 9. How is platen adjusted nearer type? 10. When necessary? 11. Explain Esc. mechanism. 12. How is fore and aft movement of Esc. rocker or plate limited? 13. Explain operation of line lock, tabulator and center stop.

Swinging Desk Stands



If you haven't room on your desk or table for your typewriter here is an excellent adjustable stand.

Rigidity is its superior quality.

Can be locked solidly in any position.

Can be used on either side of the desk.

Tops golden oak finish. Size 14 in. x 18 in.

Rods and hinges finished in oxidized copper.

THORP & MARTIN CO.

Boston, Mass., U. S. A.

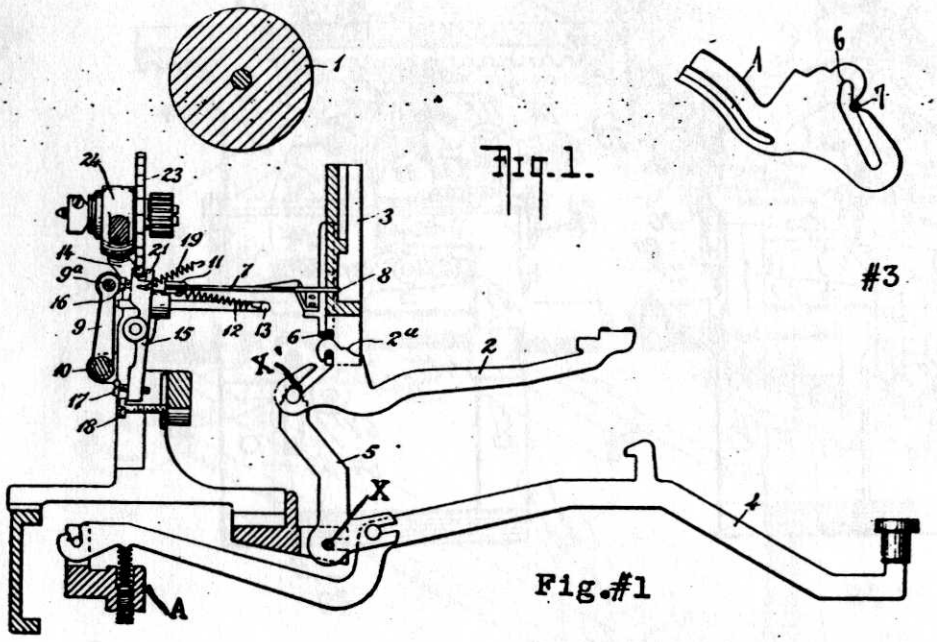
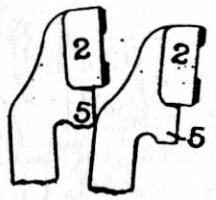


Fig.1.

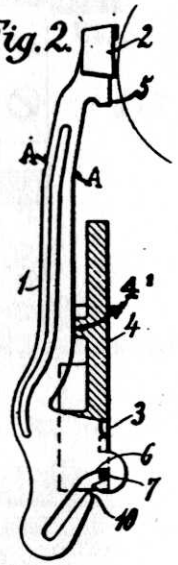
Fig.#1

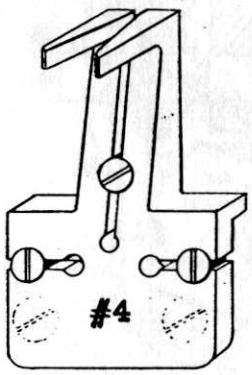
#3



#3'

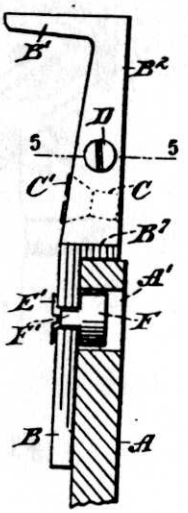
Fig.2.





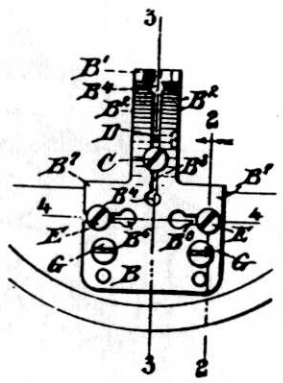
#4

#4



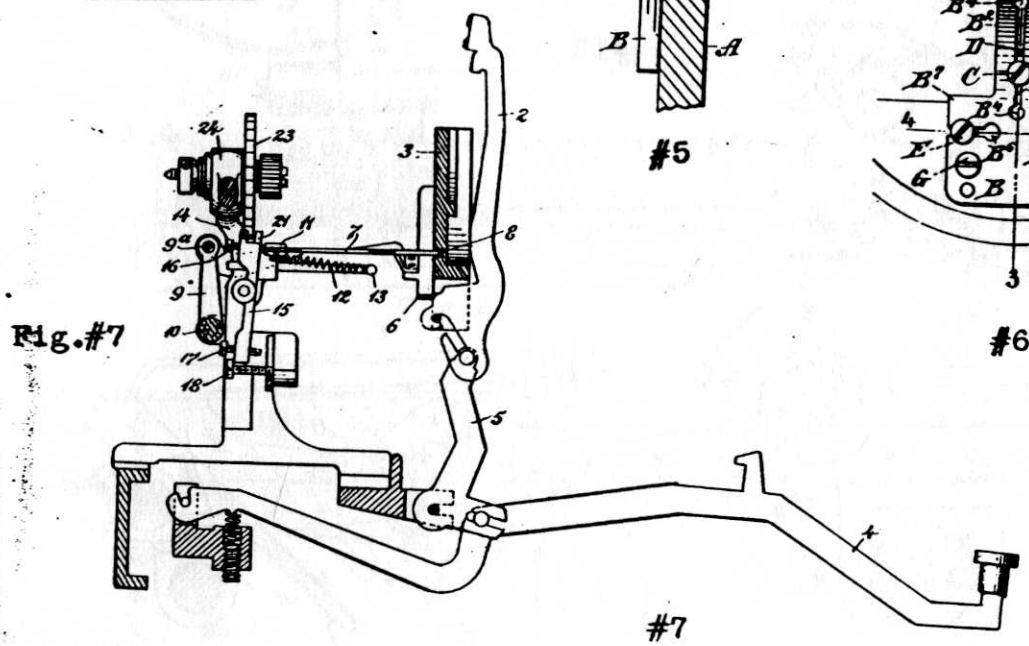
#5

#5



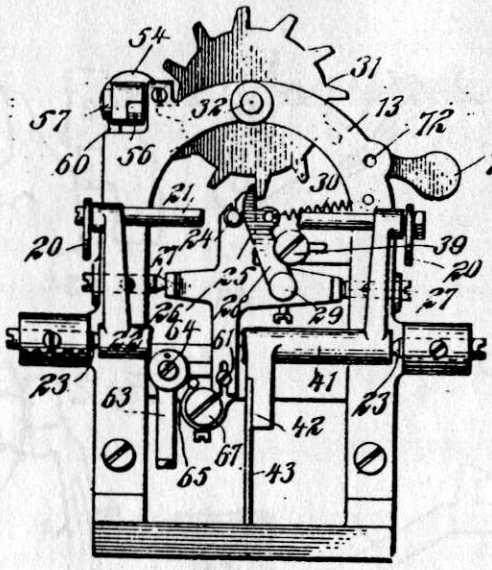
#6

Fig.#7

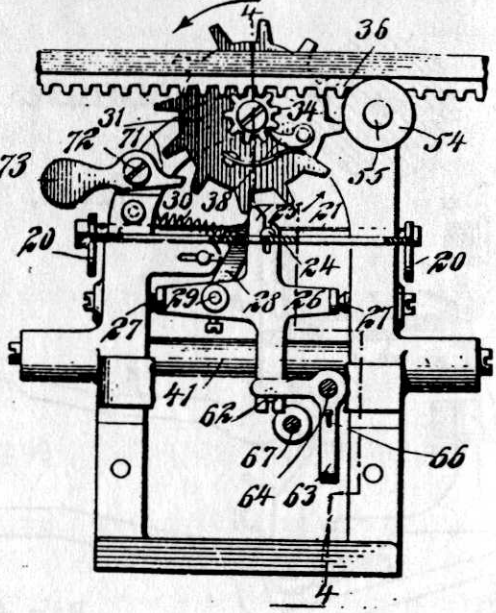


#7

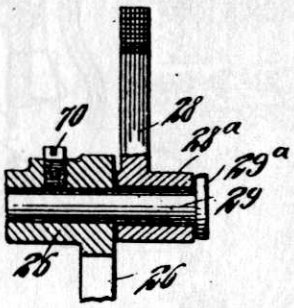
A1F889



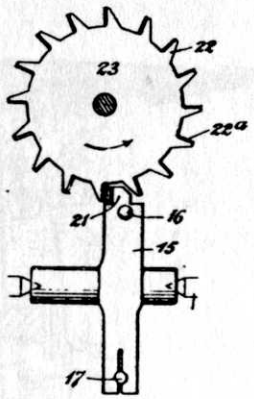
#8

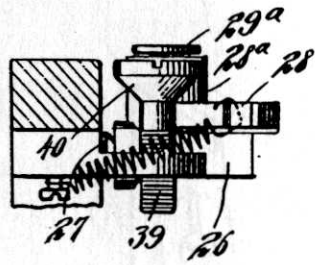


#9

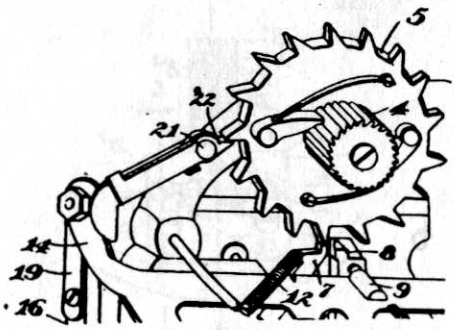


#10



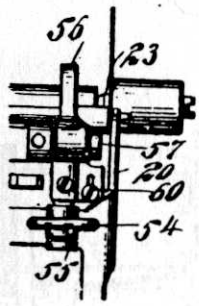


#11

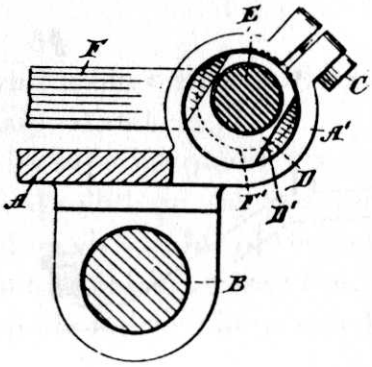


#14

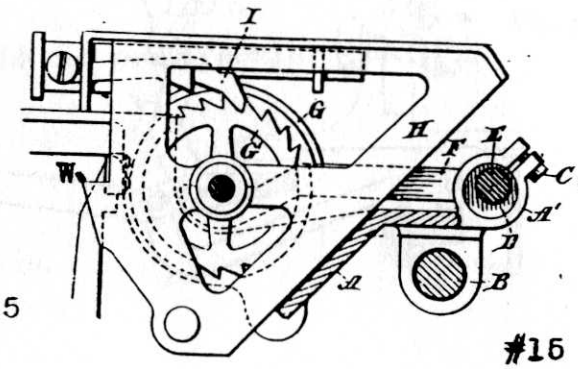
#12



#13.

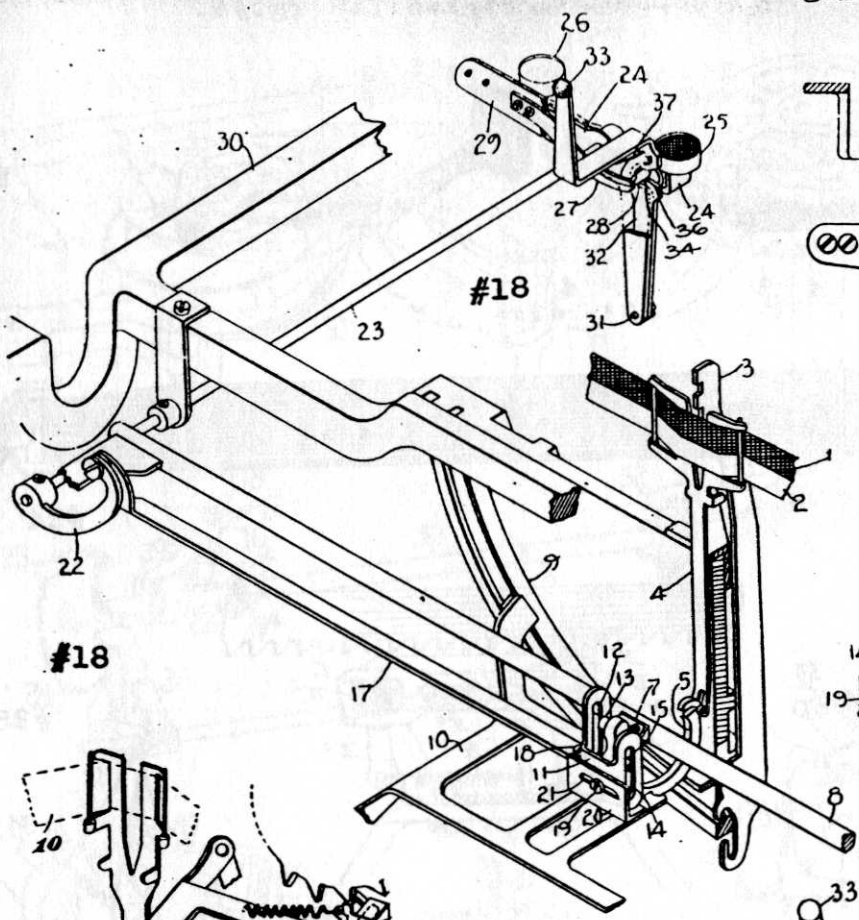


#16.

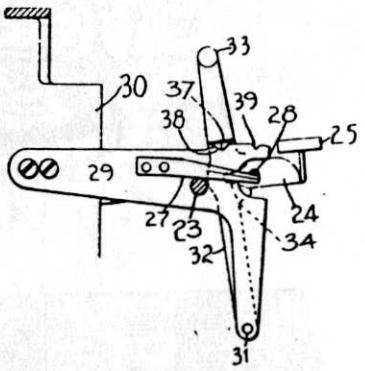


#15

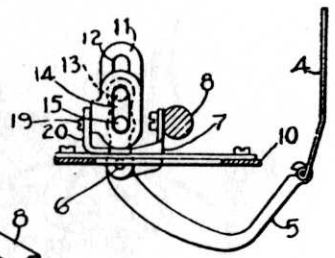
#16



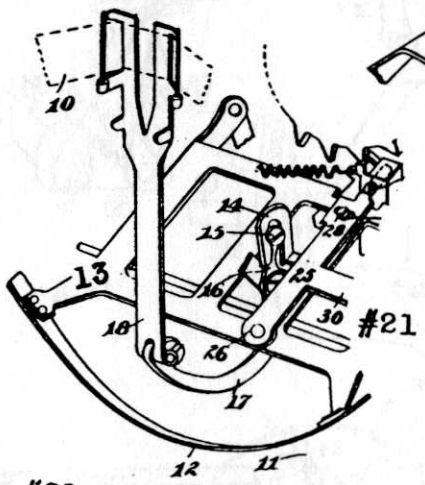
#18



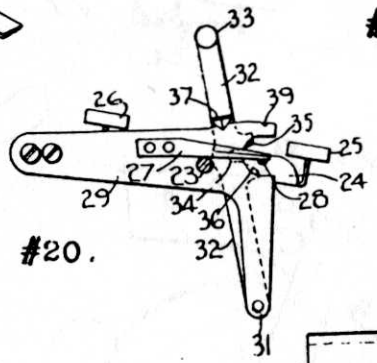
#17.



#19



#21



#20.

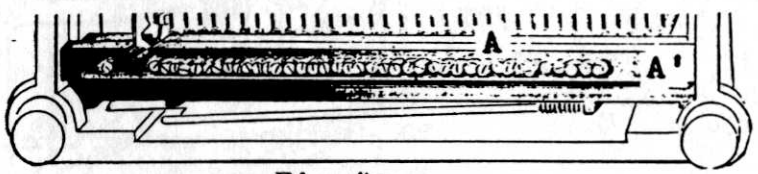
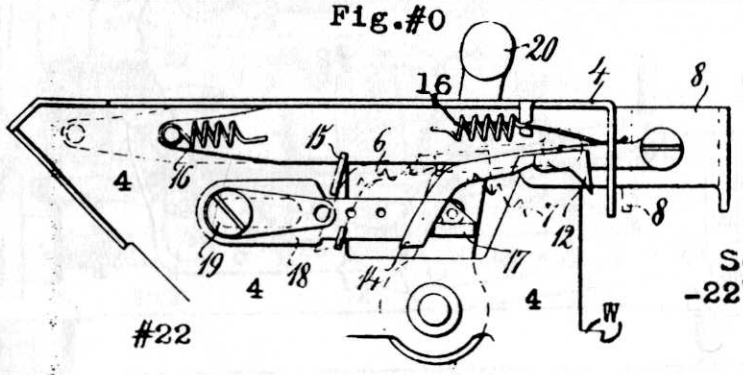
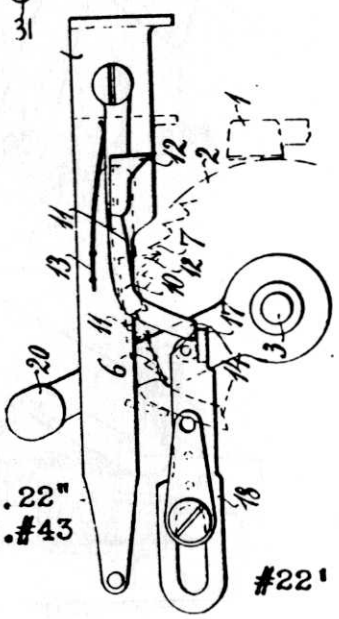


Fig.#0



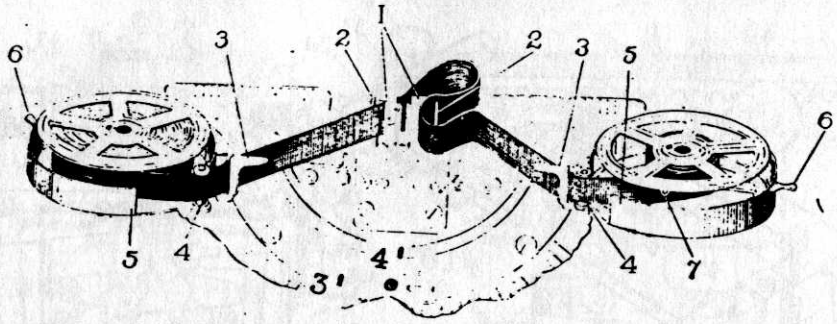
#22



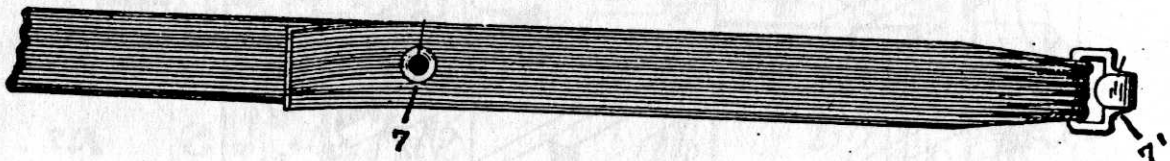
#22'

See Fs.22" -22"'-Pg.#43

#23

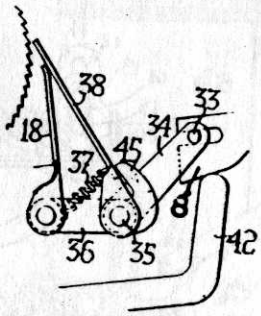


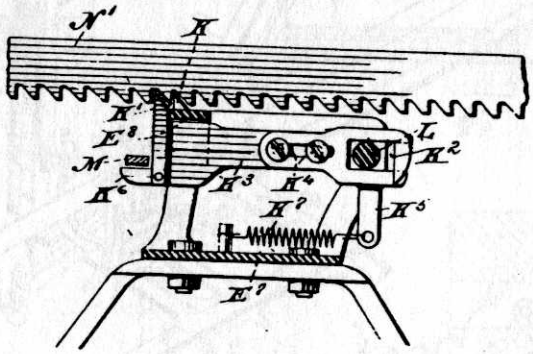
#23



#24

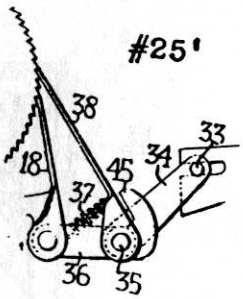
#25

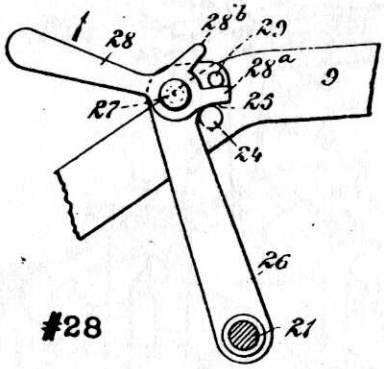




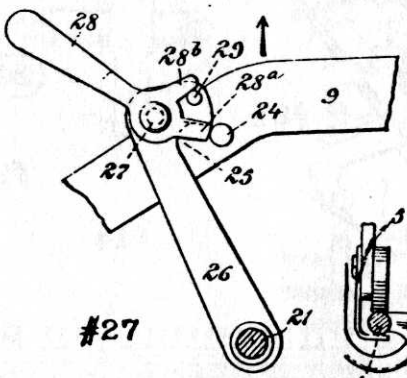
#26

#25'

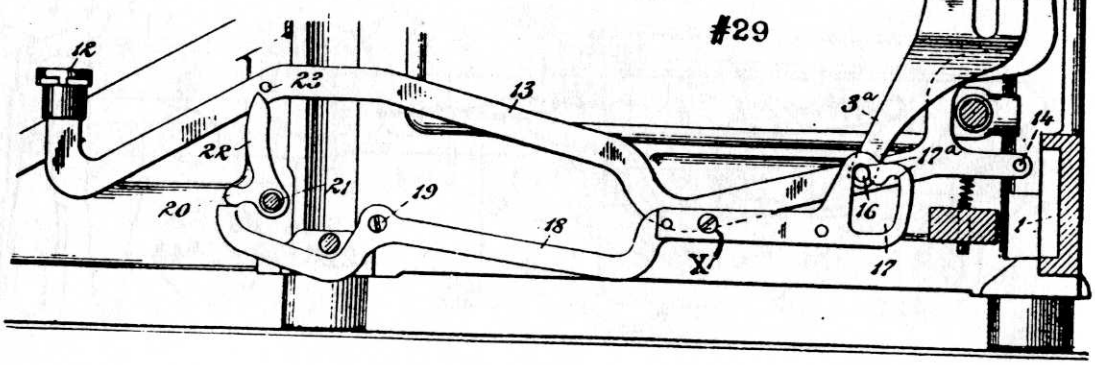




#28

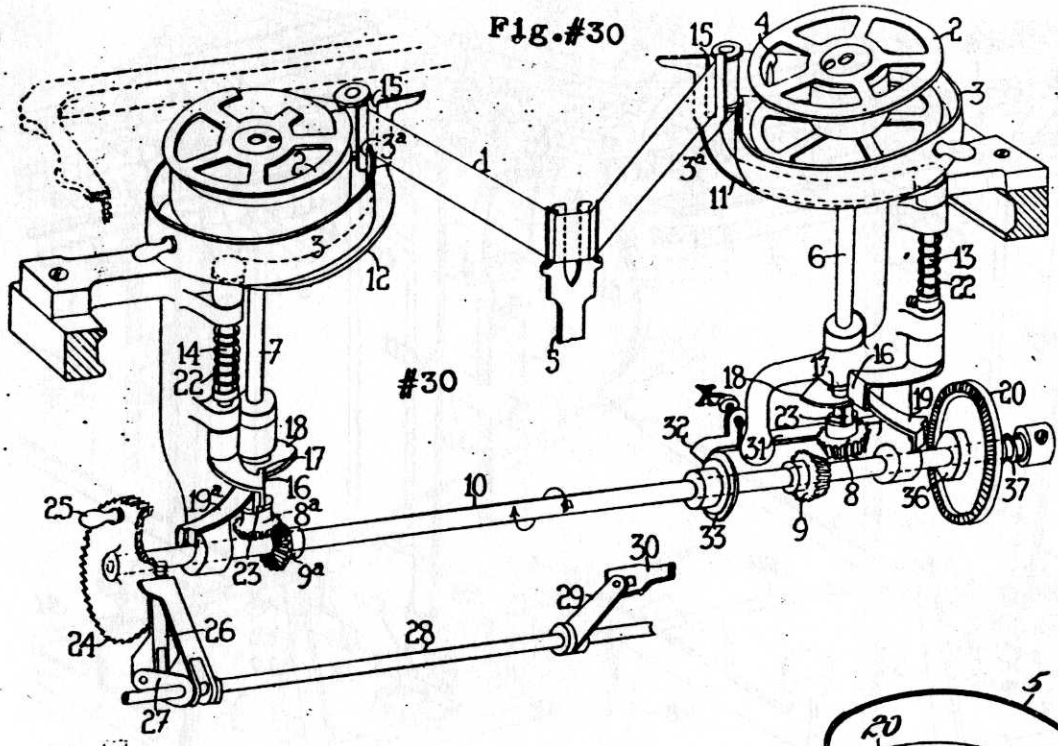


#27

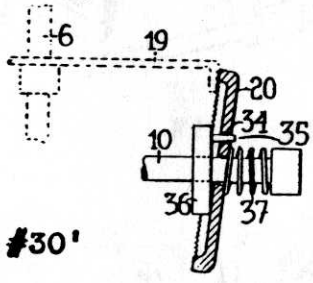


#29

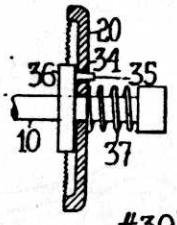
Fig.#30



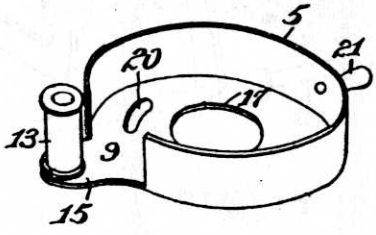
#30



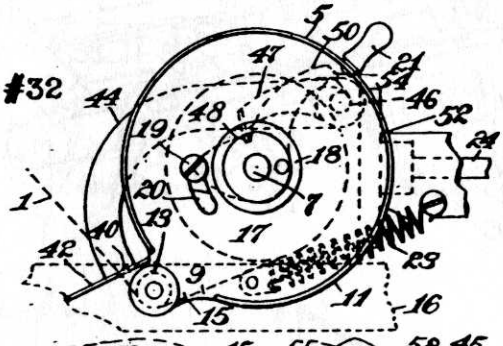
#30'



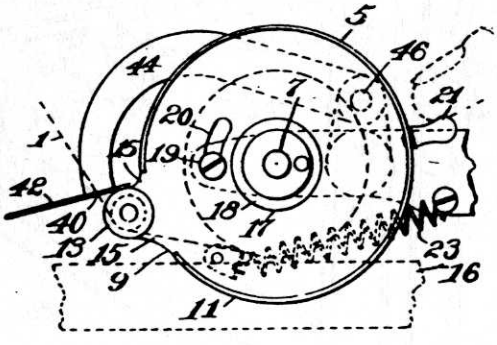
#30"



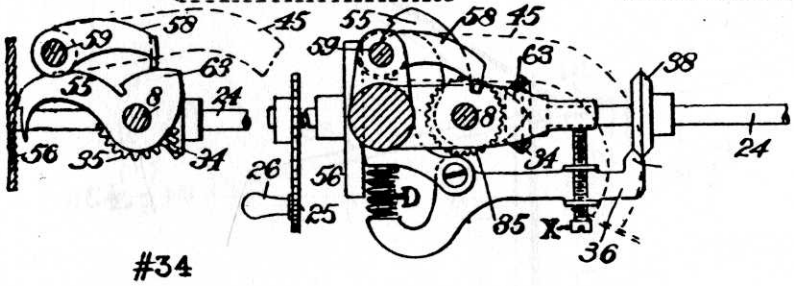
#31



#32

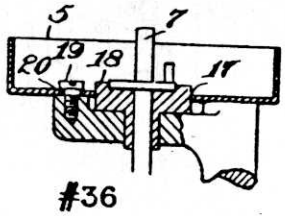


#33



#34

#35



#36

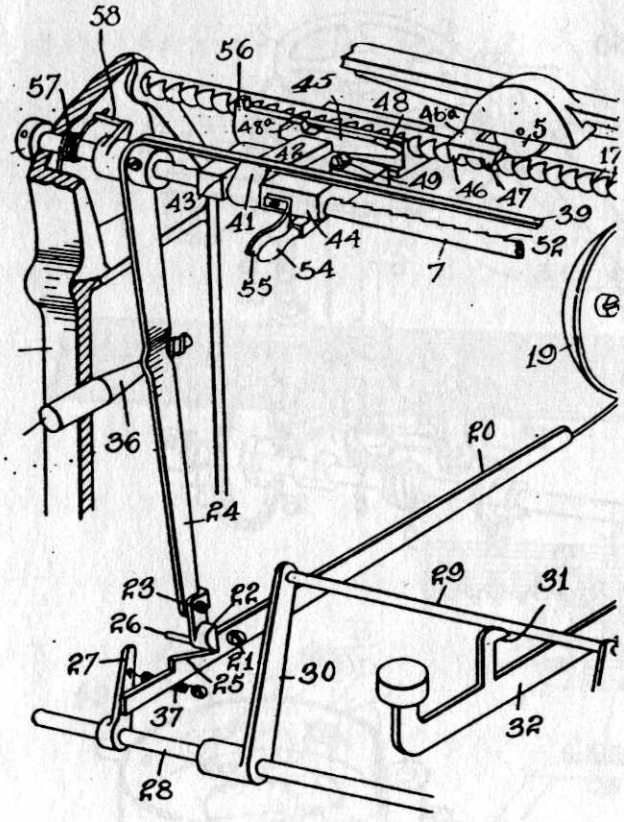


Fig.#37

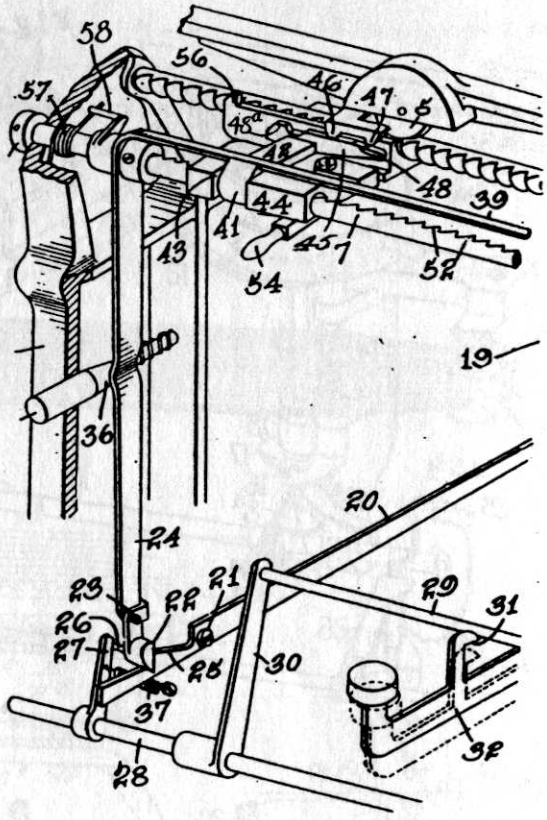


Fig.#38

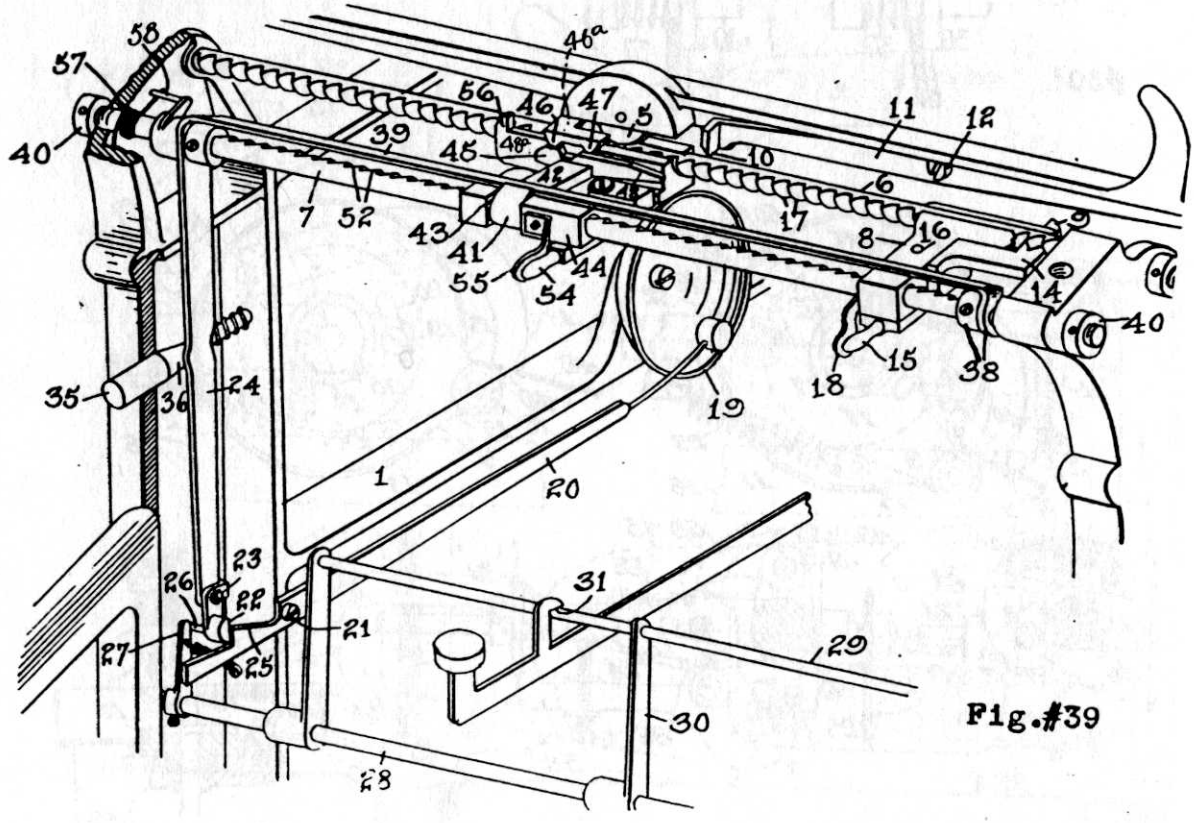


Fig.#39

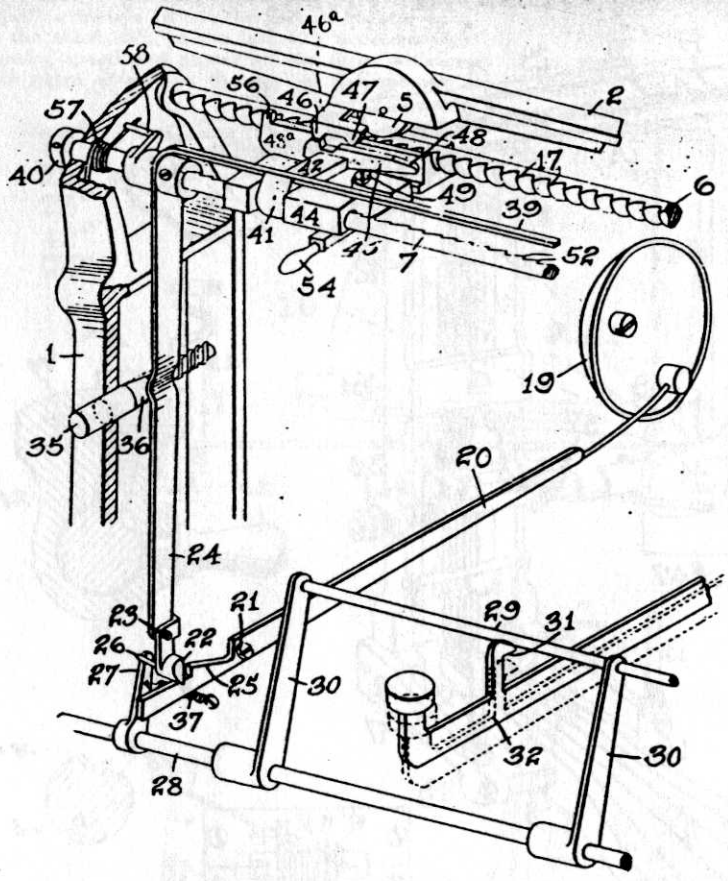


Fig.#40

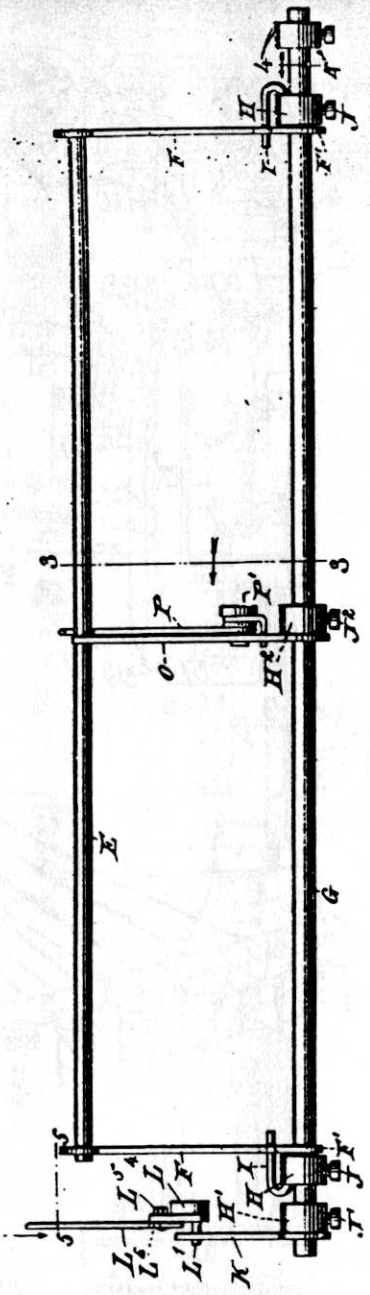
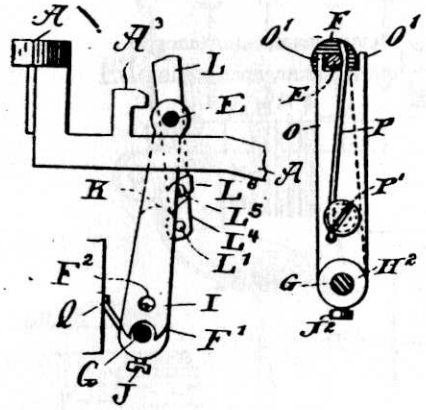
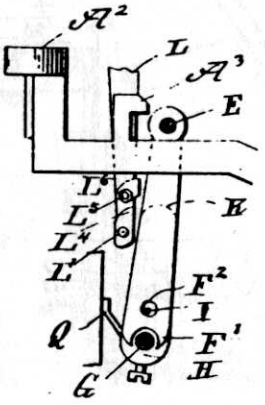


Fig.#46



#41 #42



#43

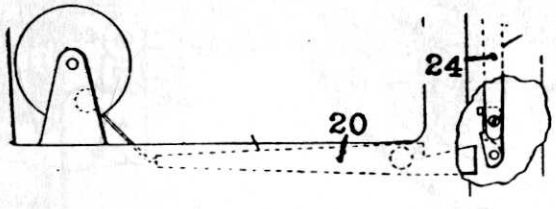


Fig.#44

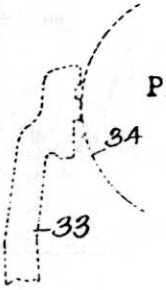


Fig.#45

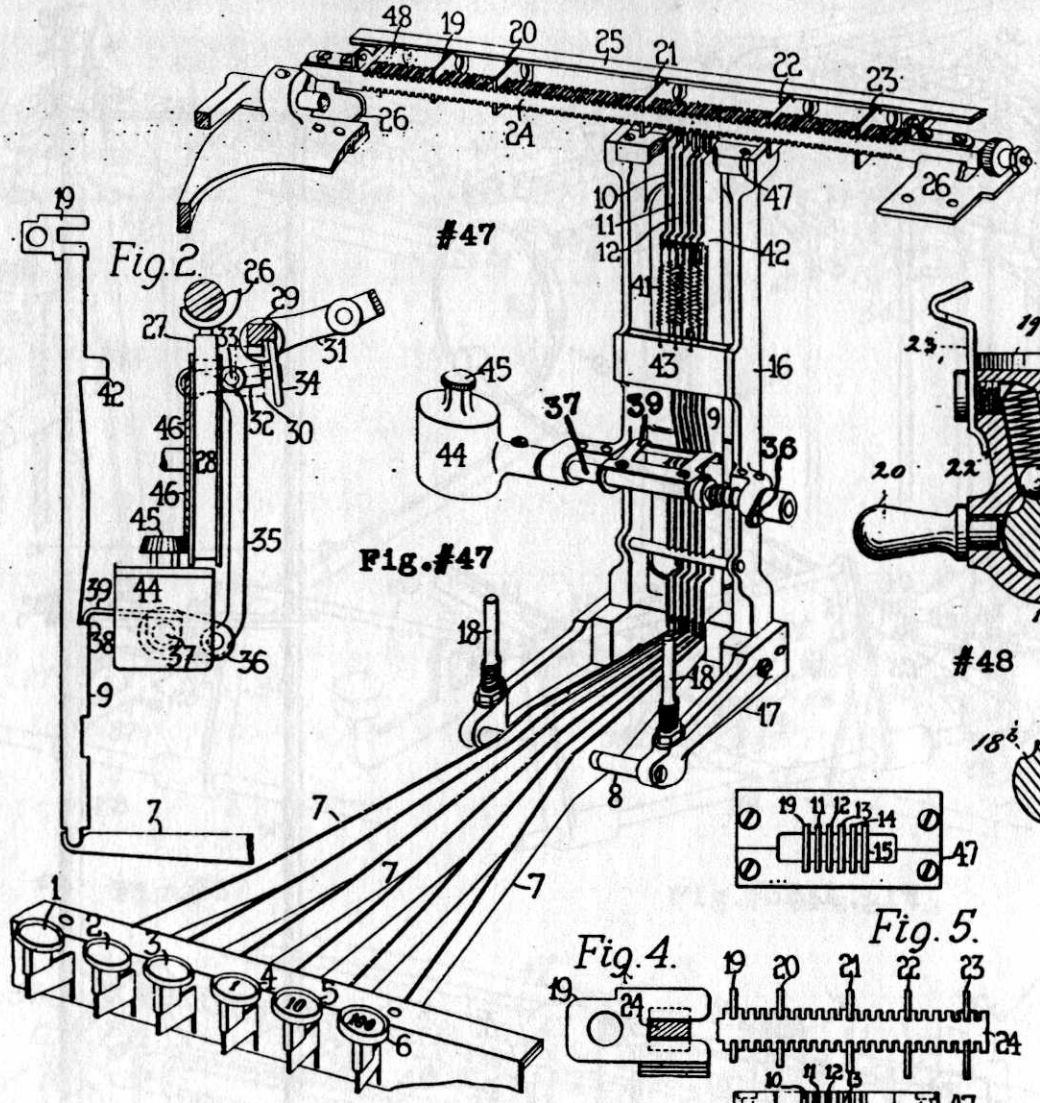
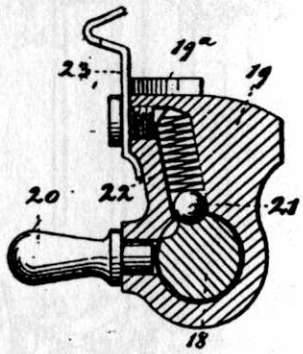


Fig. 2.

#47

Fig.#47

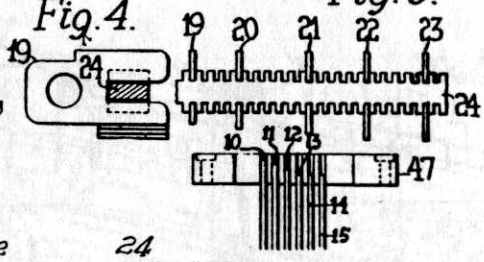


#48

#49

Fig. 5.

Fig. 4.



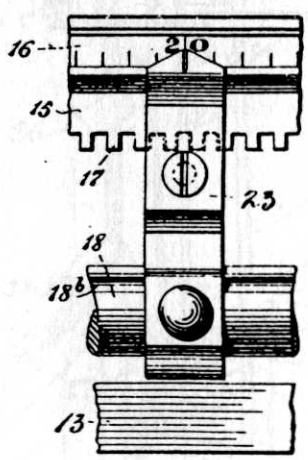
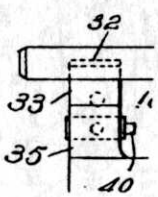
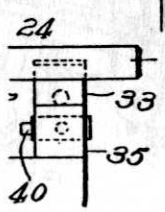


Fig.#52.

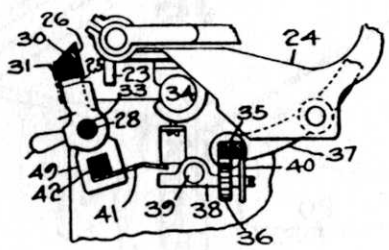
#50



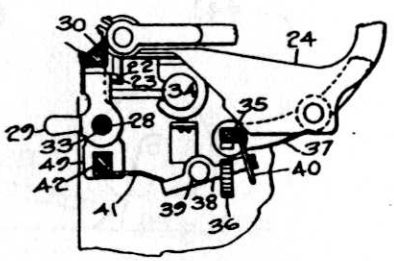
#50



#51



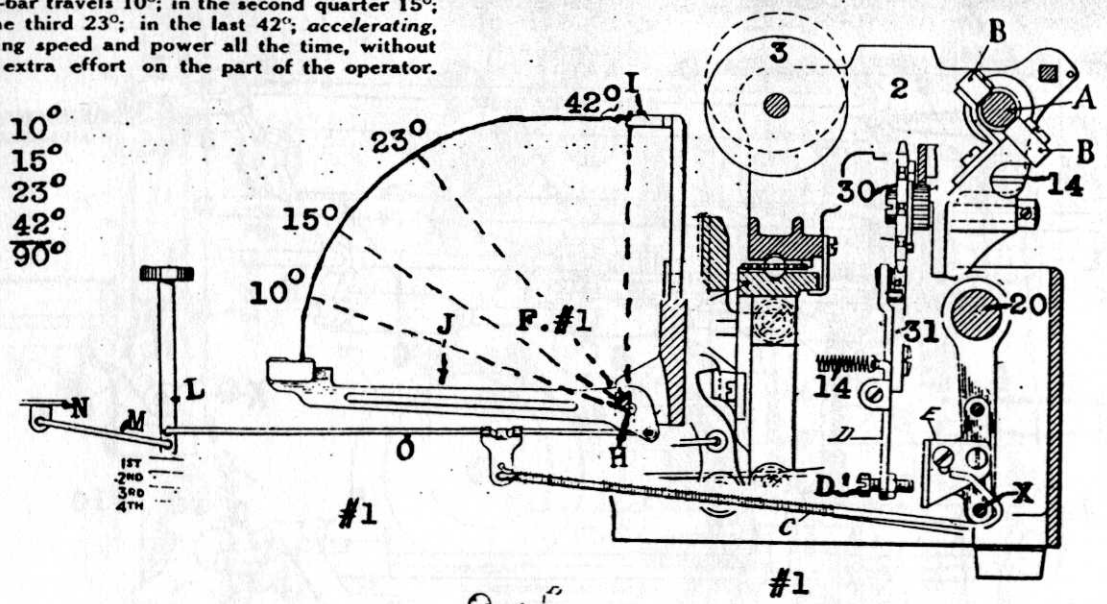
#53



#54

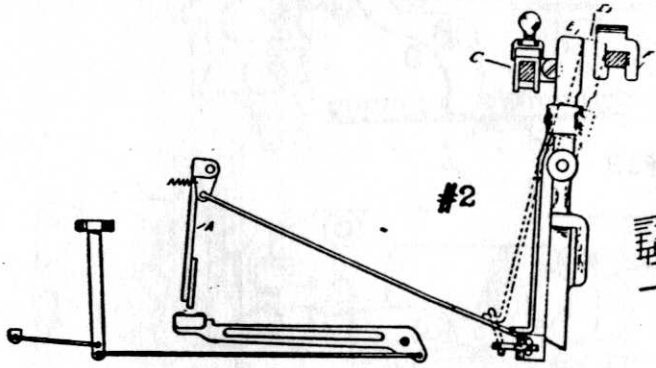
ROYAL TYPEWRITER Pg.#9.

Note that in the first quarter of the stroke the type-bar travels 10°; in the second quarter 15°; in the third 23°; in the last 42°; *accelerating*, gaining speed and power all the time, without any extra effort on the part of the operator.

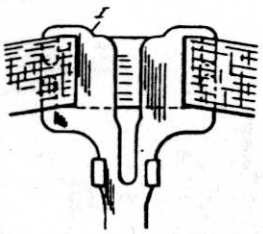


#1

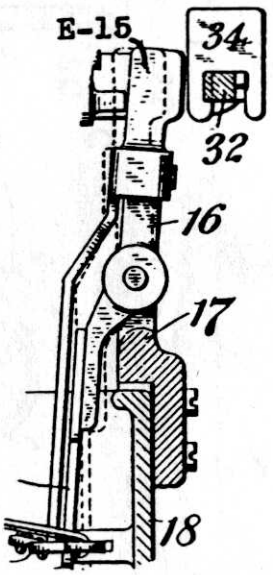
#1



#2

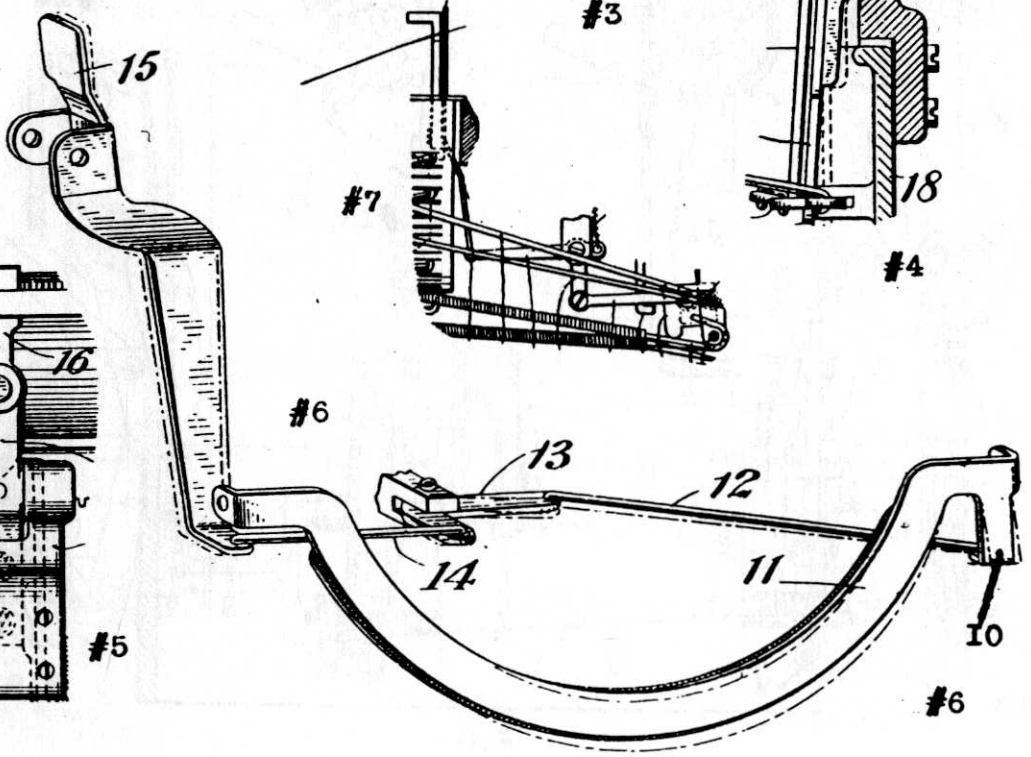


#3

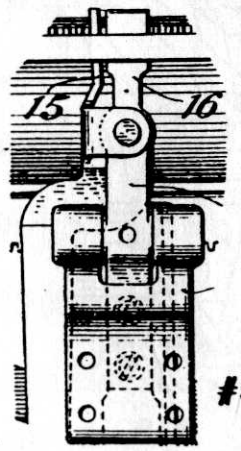


#4

#7

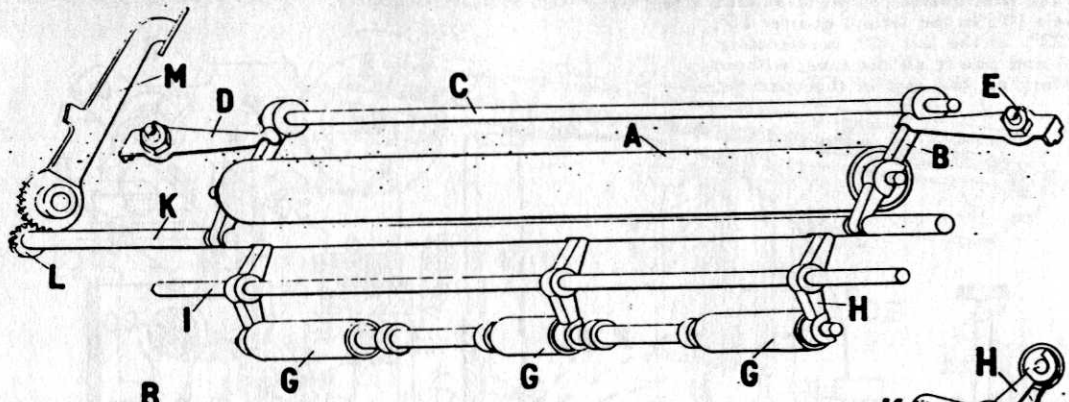


#6

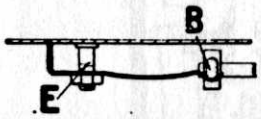


#5

#6



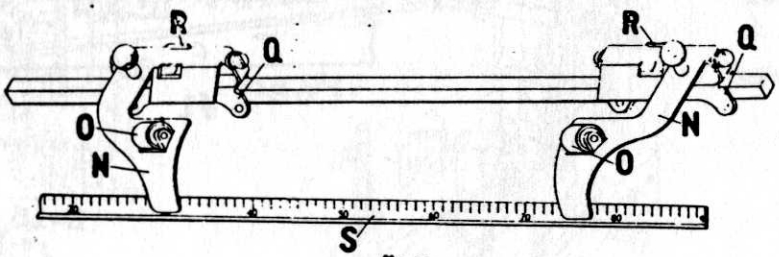
#8



#9

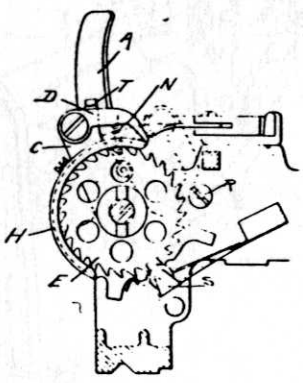
#10

#11

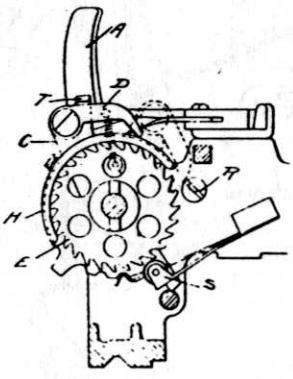


#12

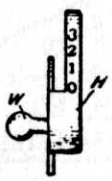
#14



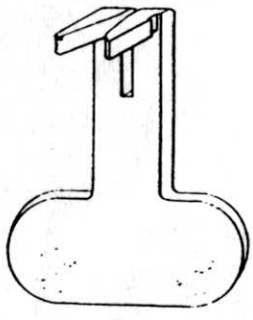
#15



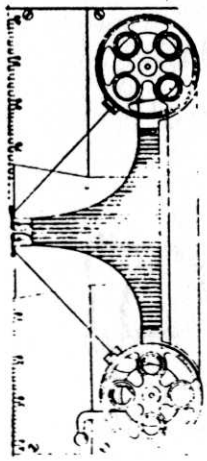
#16



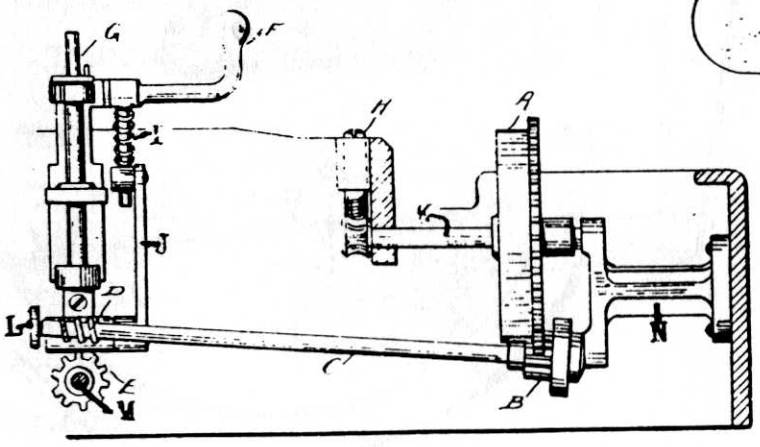
#13



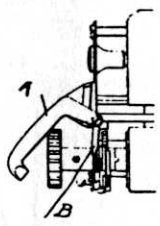
#17



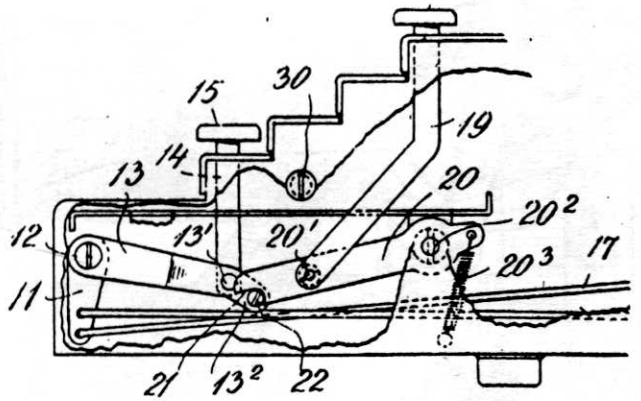
#18



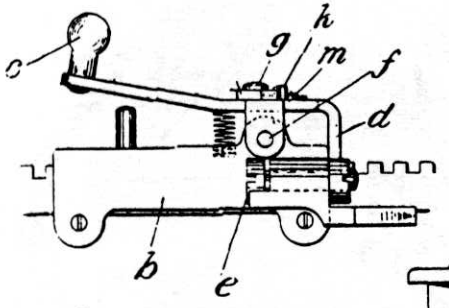
#20



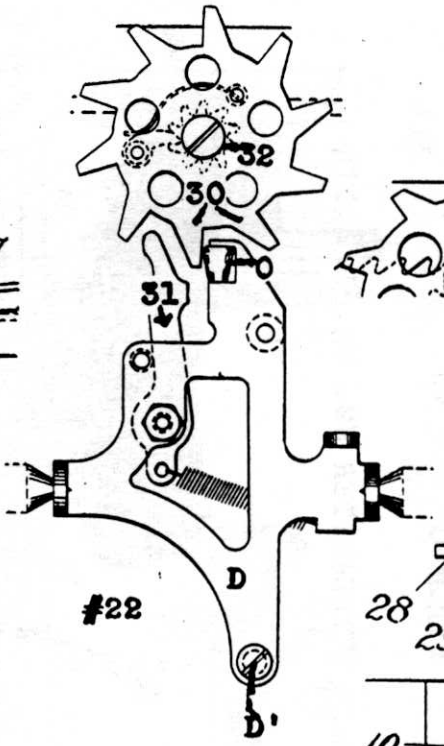
#19



#21

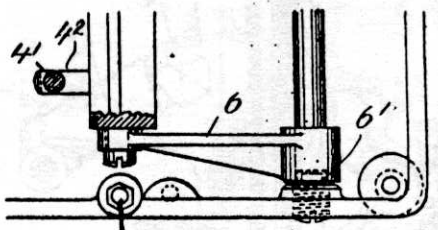


#25



#22

#23



#24

27

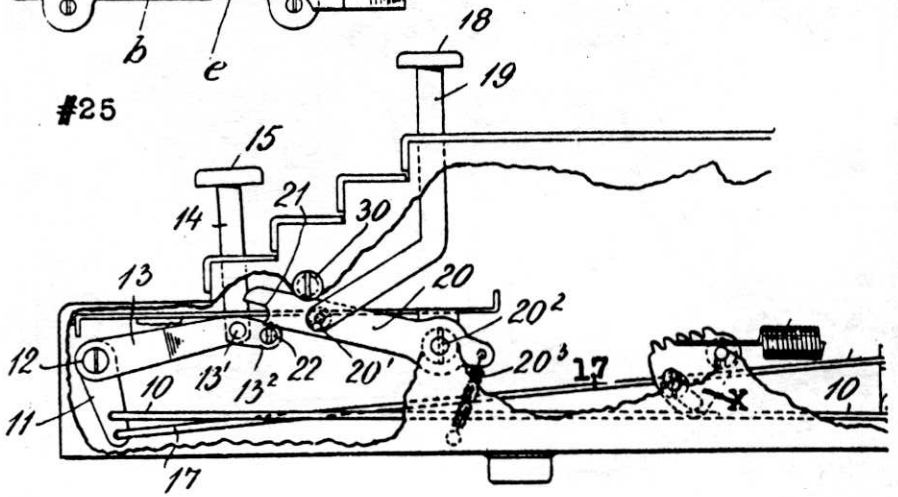


Fig.#26

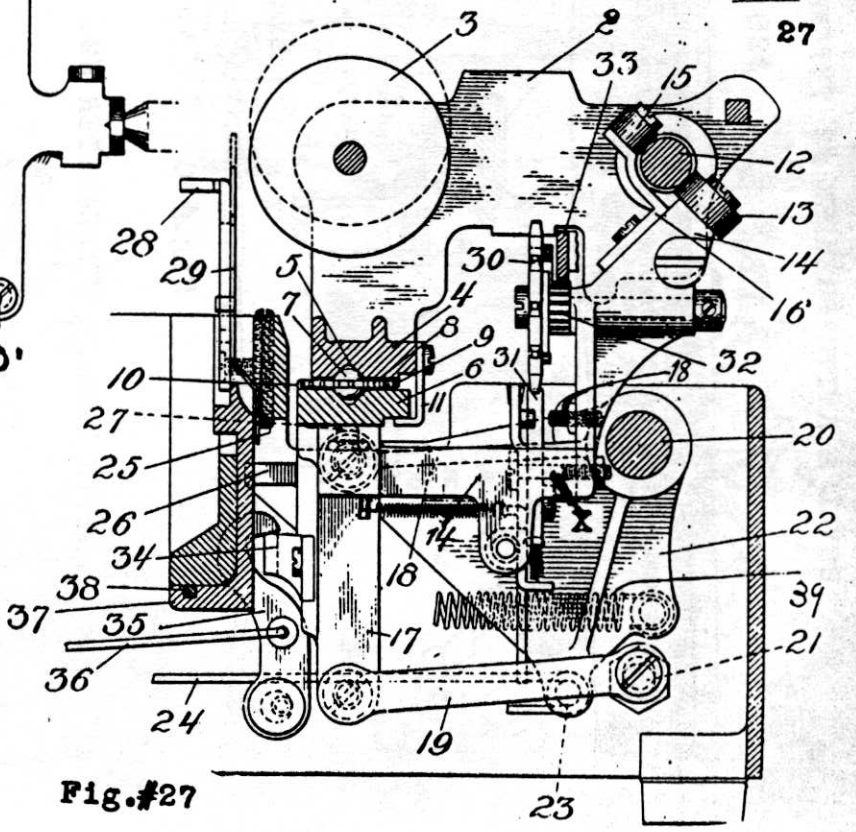


Fig.#27

ROYAL TYPEWRITER PG.#11.

ROYAL & SMITH PREMIER #2 TYPEWRITER Pg.#12 .

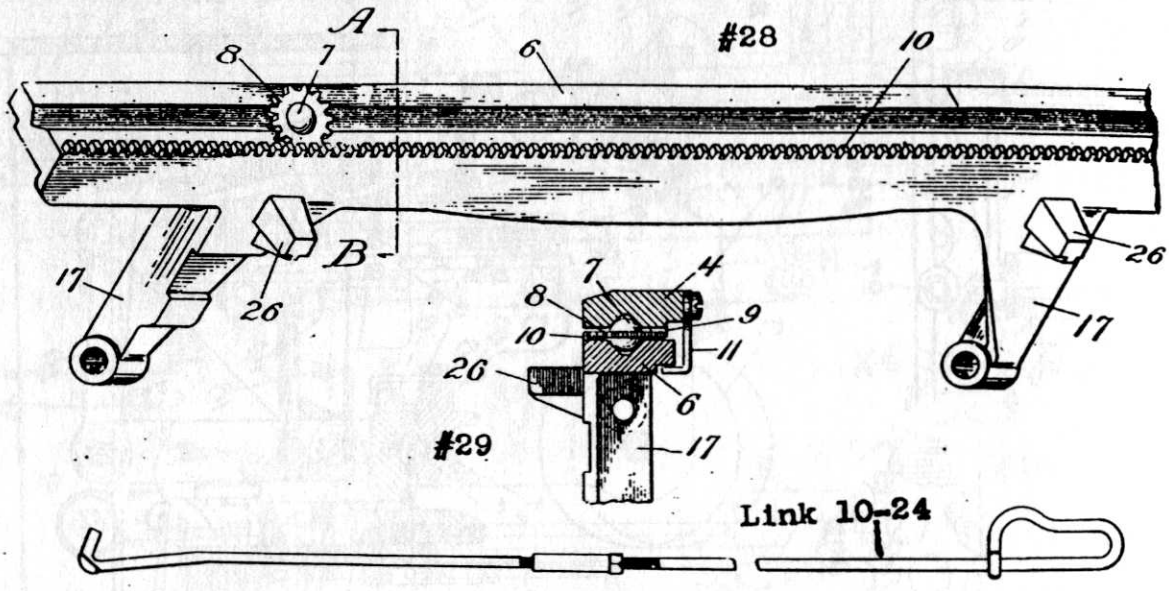
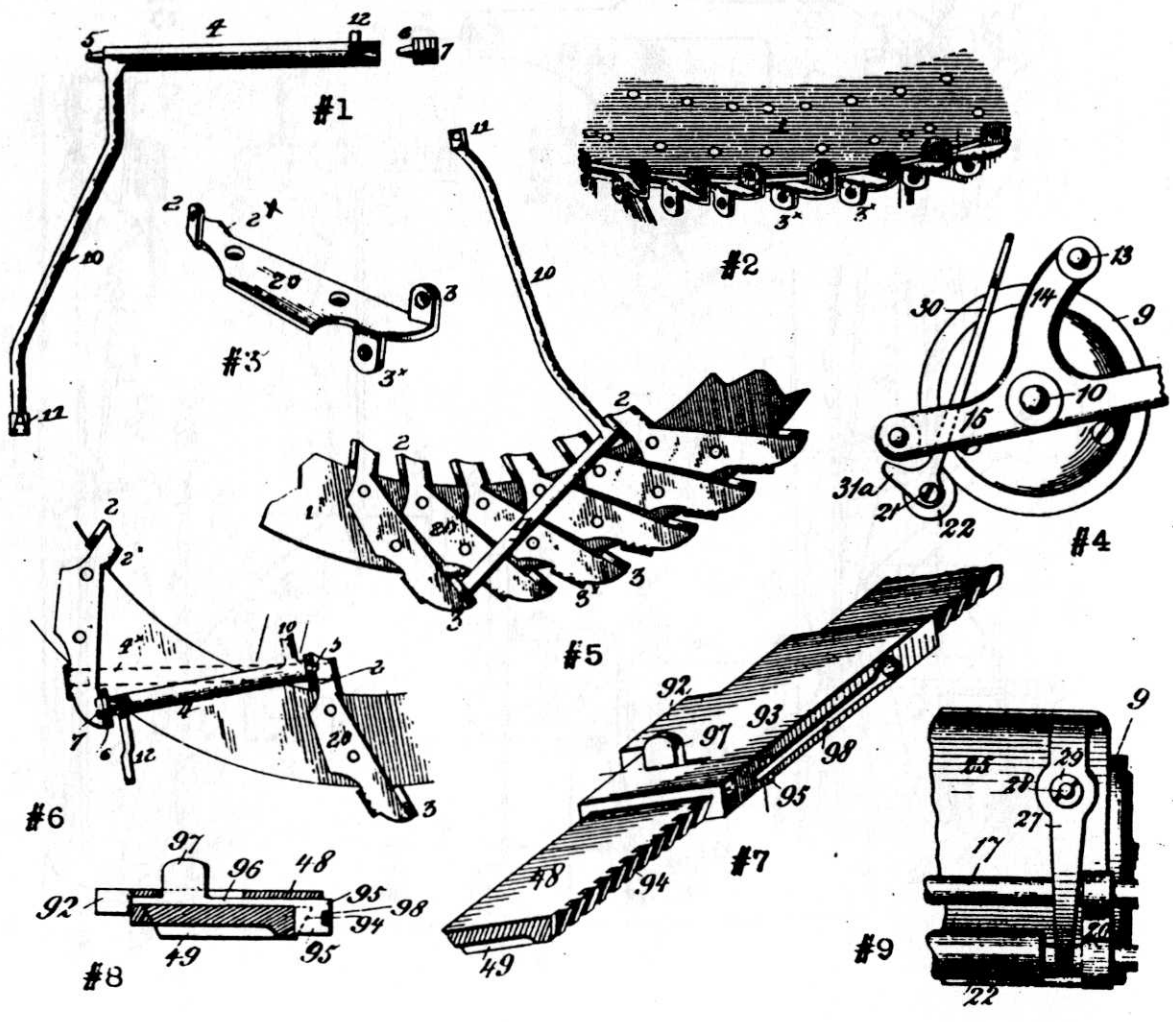
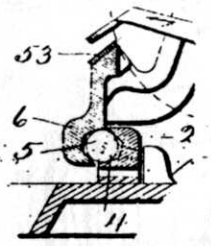
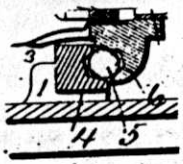


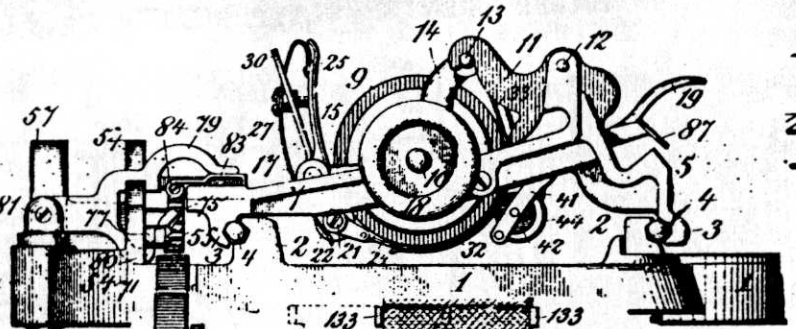
Fig.#30

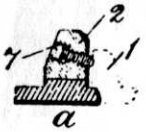
SMITH PREMIER TYPEWRITER #2. Pg.#12.



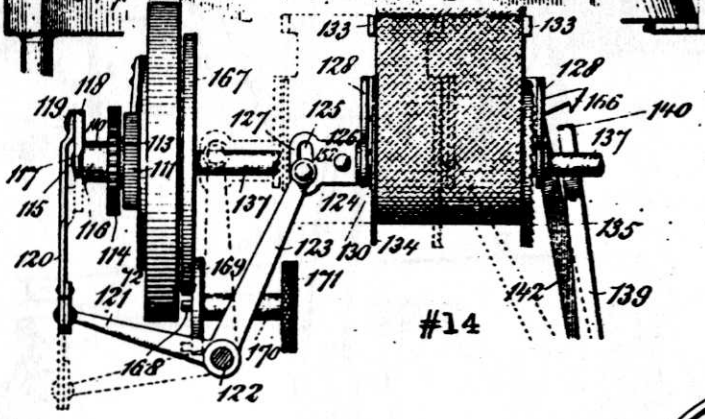

#11

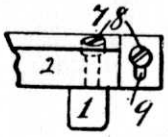

#10

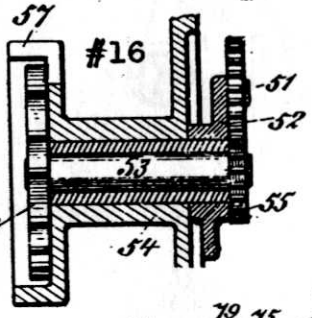


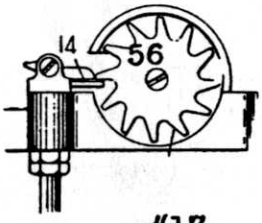

#12

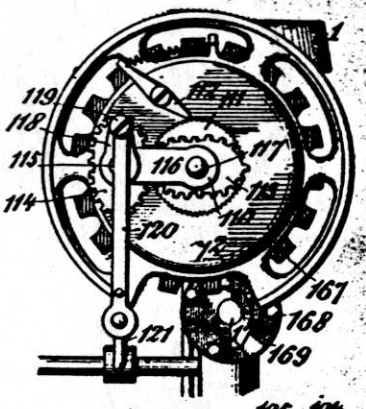
#13

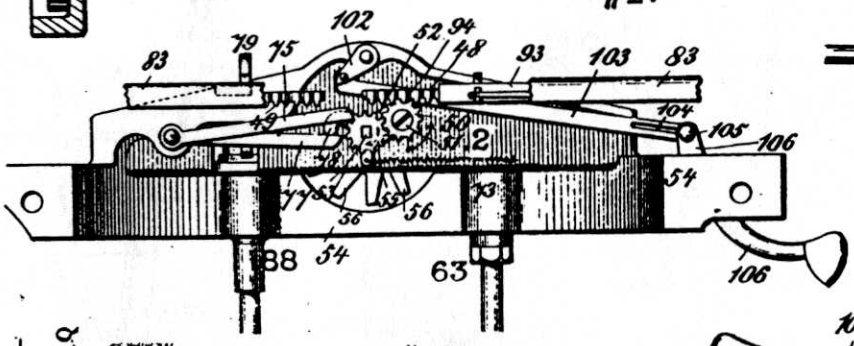

#14

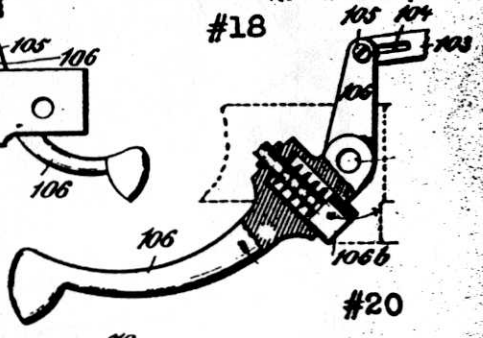

#15

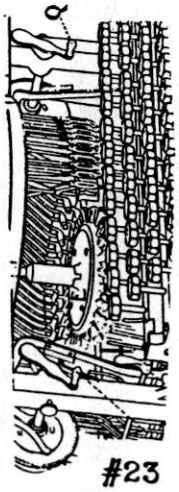

#16

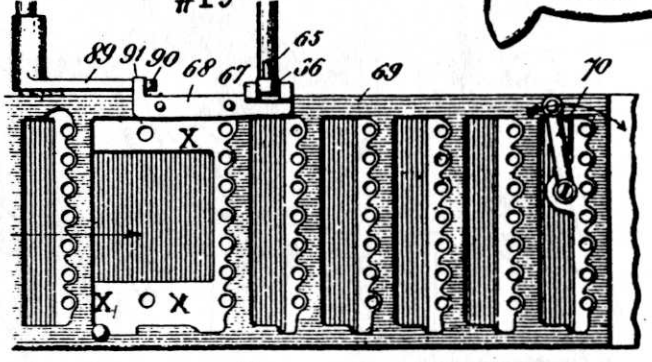

#17

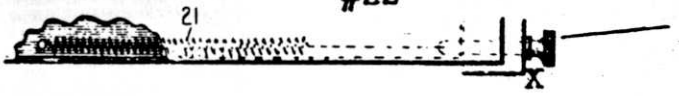

#18

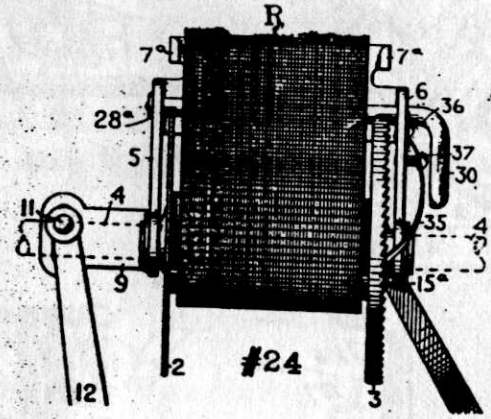

#19

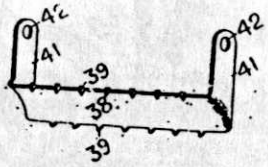

#20

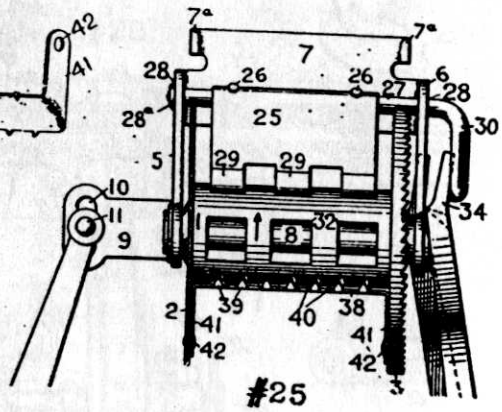

#23

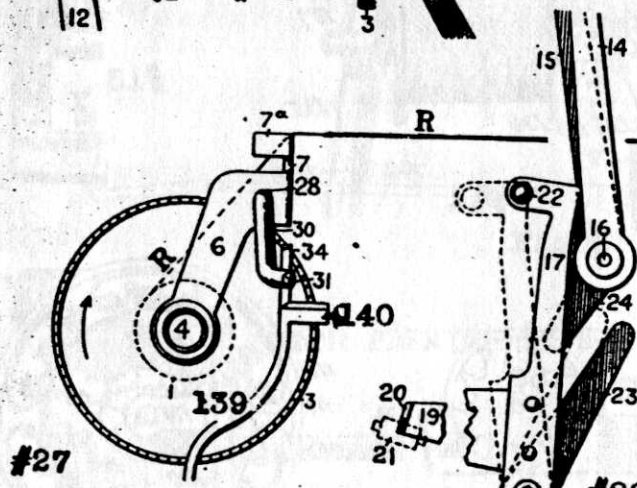

#21

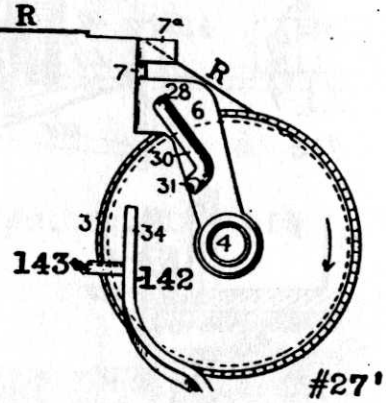

#22

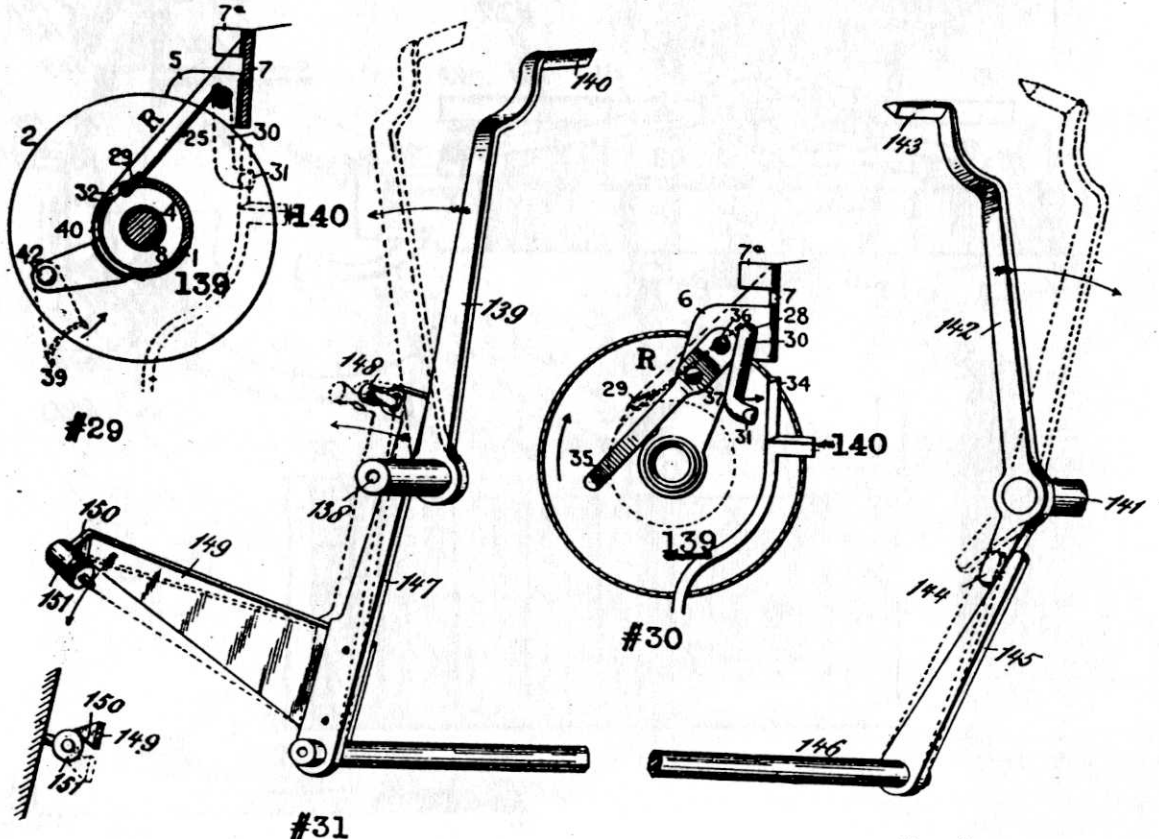

R
#24

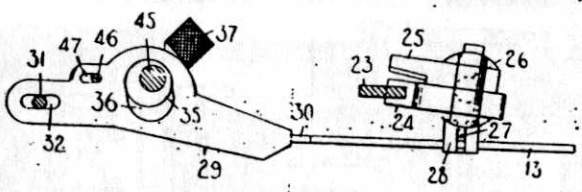

#26


#25

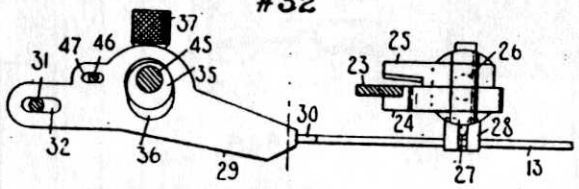

R
#27
#28


R
#27'

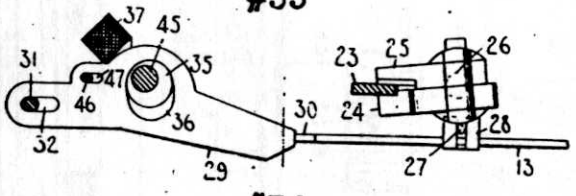

#29
#30
#31
#31'



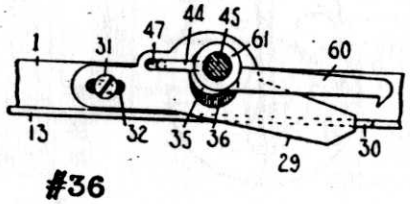
#32



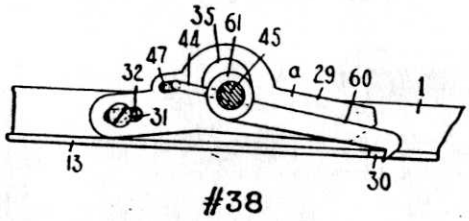
#33



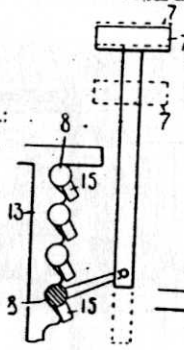
#34



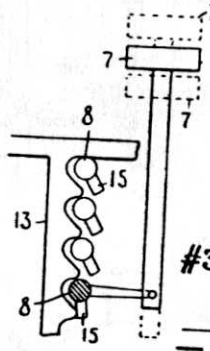
#36



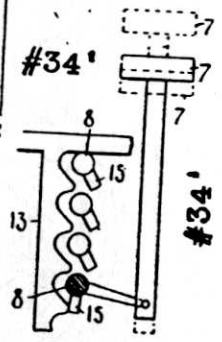
#38



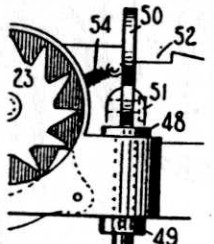
#32'

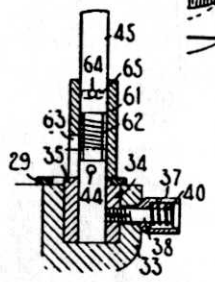


#33'



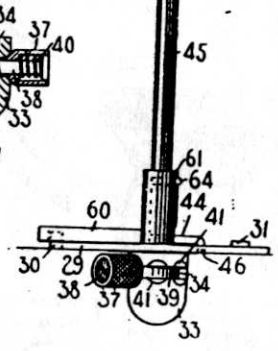
#34'

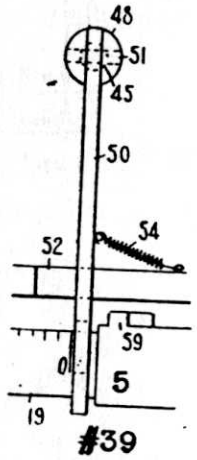




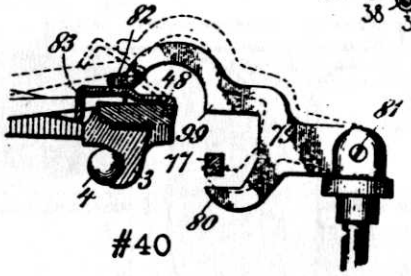
#37

#35

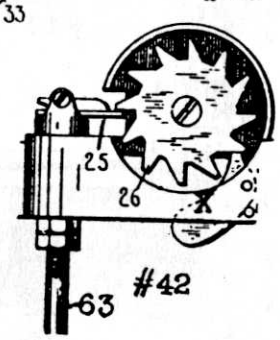




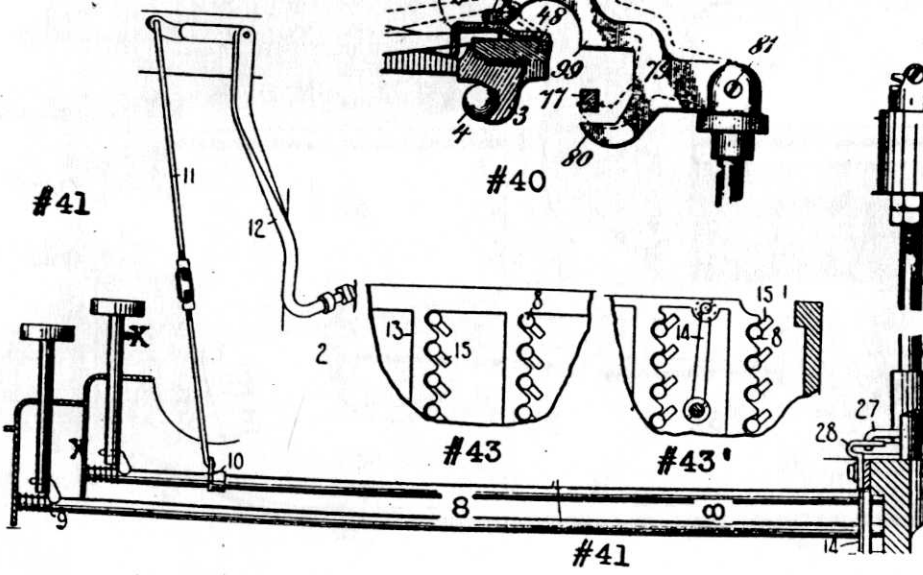
#39



#40



#42



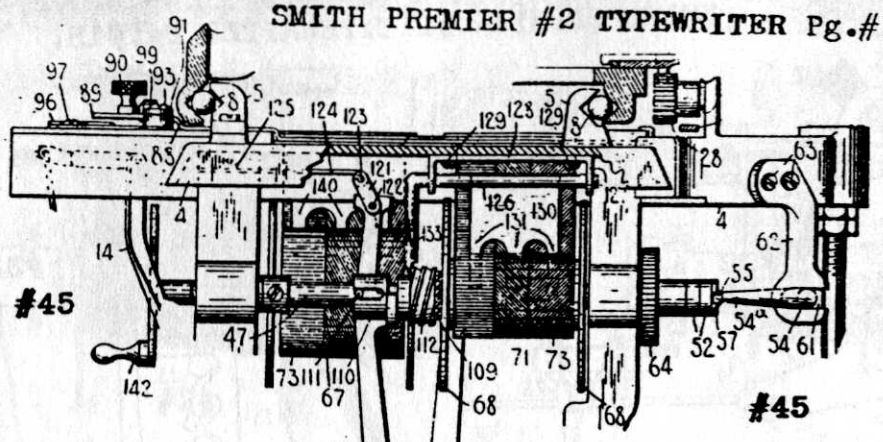
#41

#43

#43'

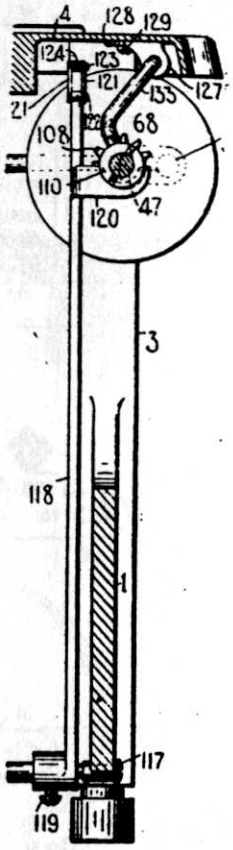
#41

#44

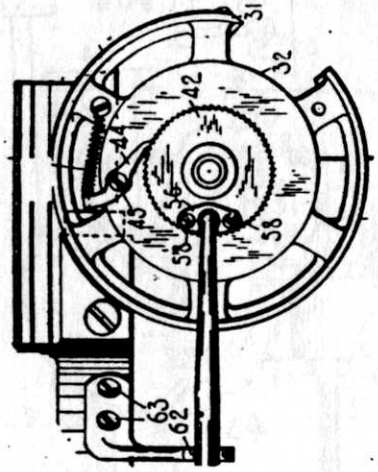


#45

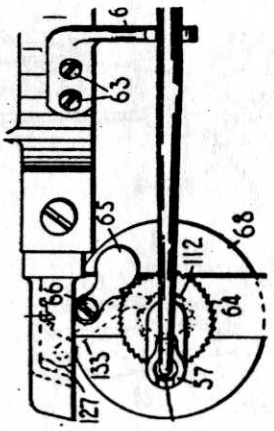
#45



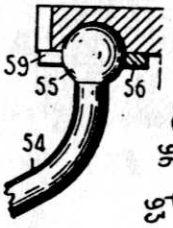
#47



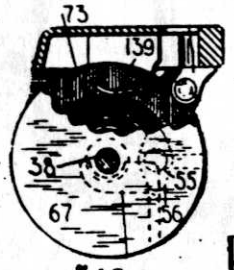
#46-right



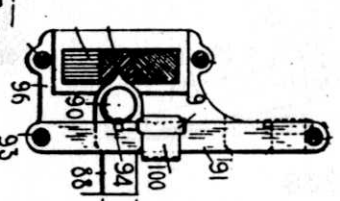
#46'-left

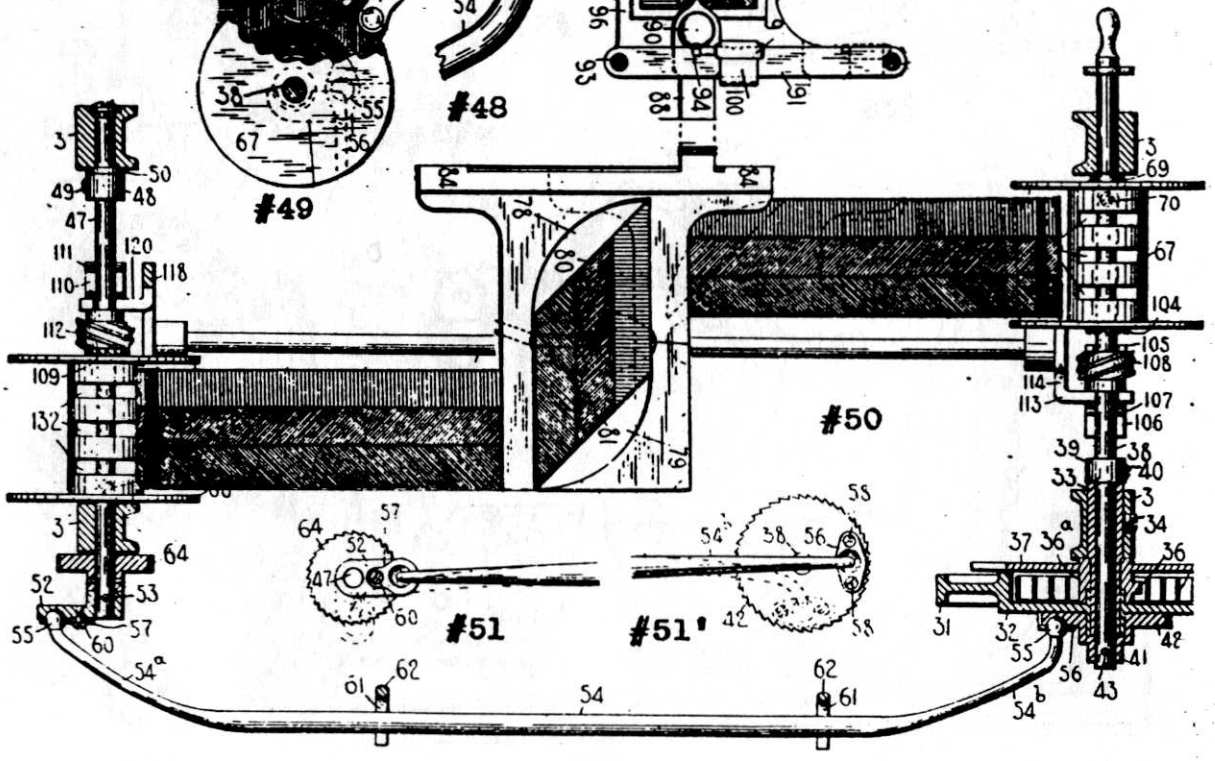


#48



#49



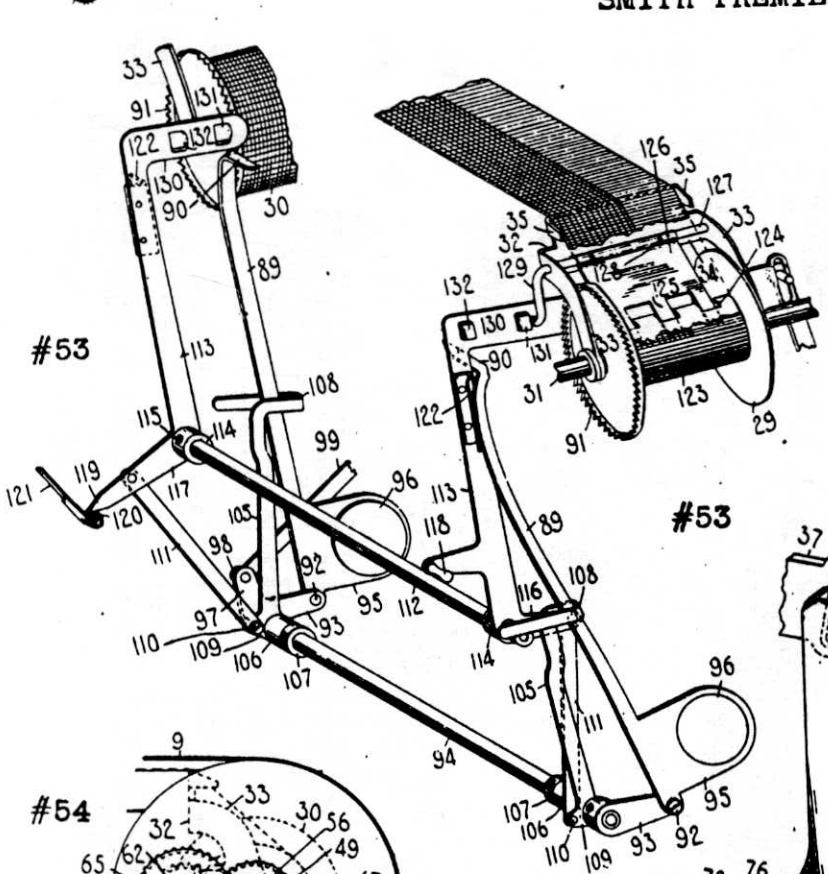


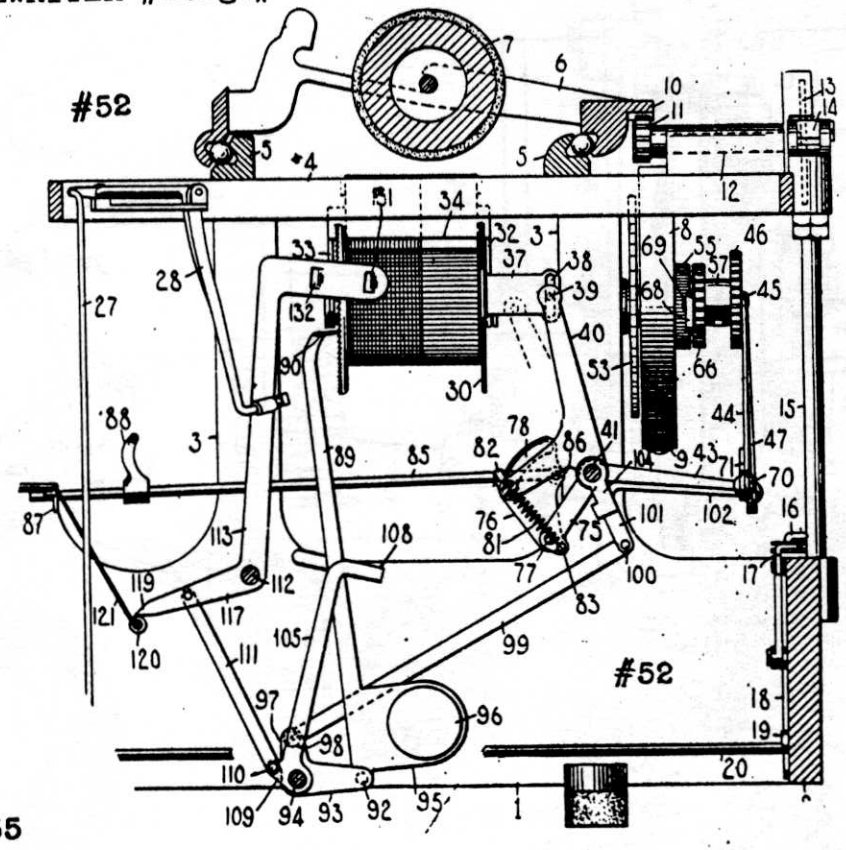
#50

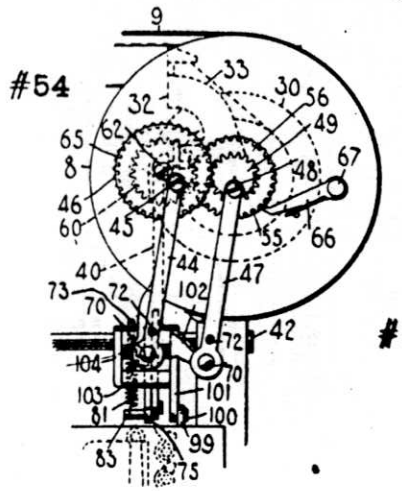
#51

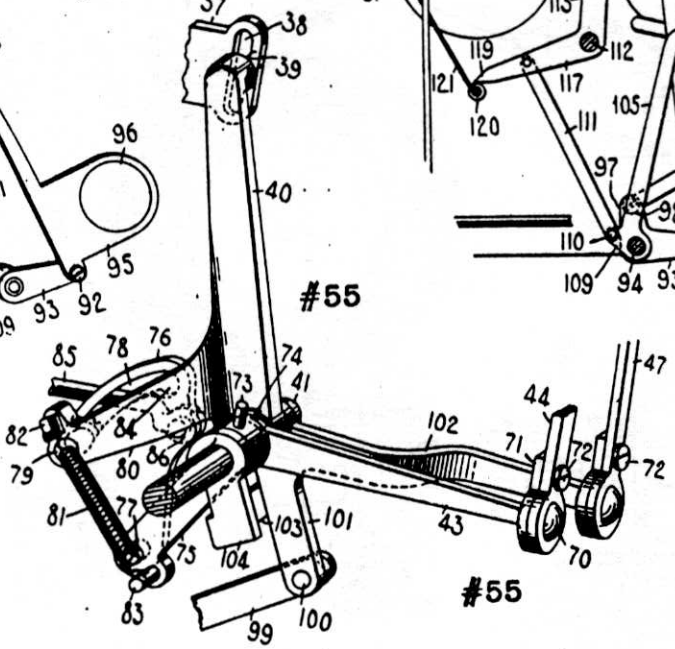
#51'

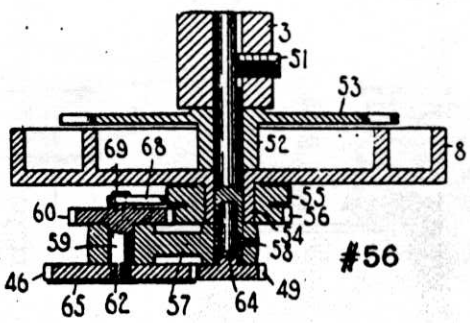
SMITH PREMIER TYPEWRITER #2.Pg.#17.



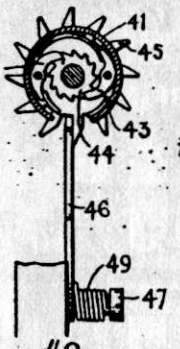






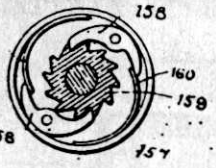


SMITH PREMIER #2 TYPEWRITER Pg.#17

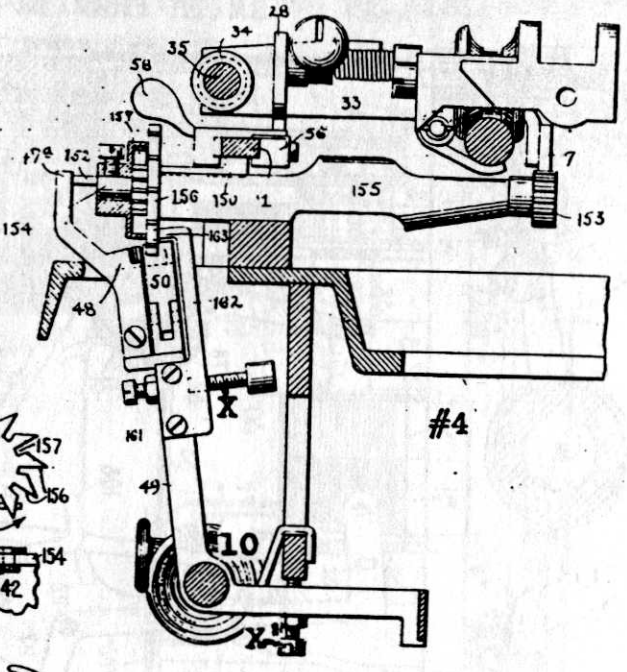


#1

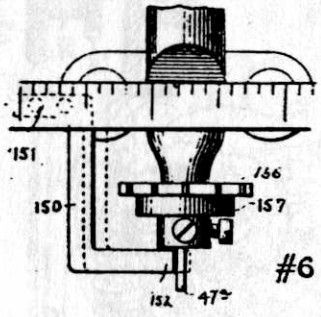
#2



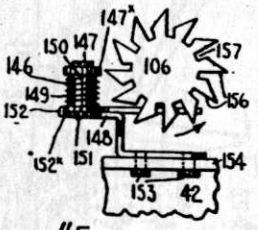
#3



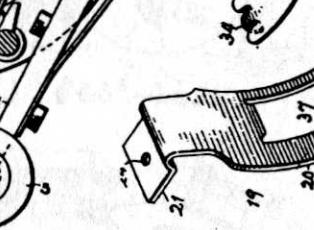
#4

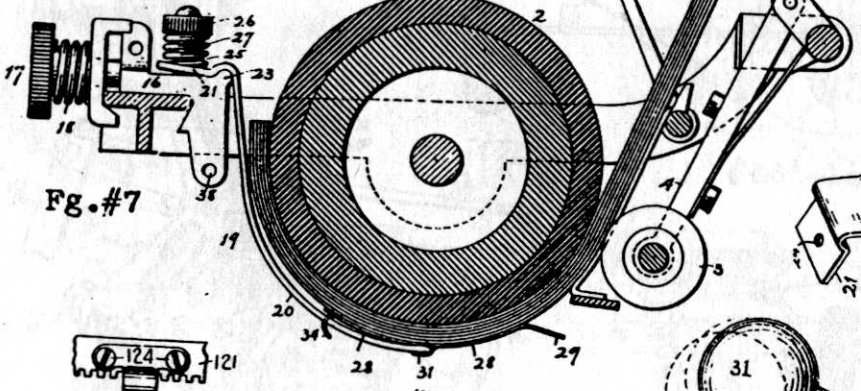


#6



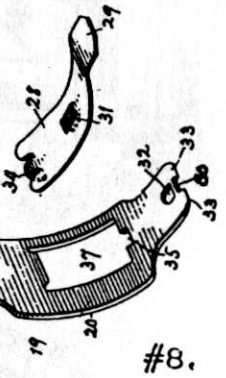
#5



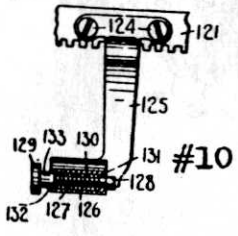


Fg.#7

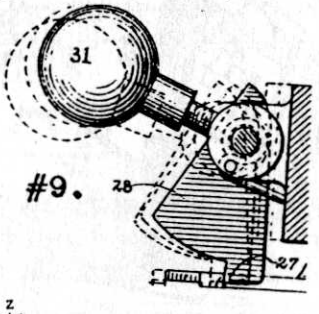
#7



#8.



#10



#9.

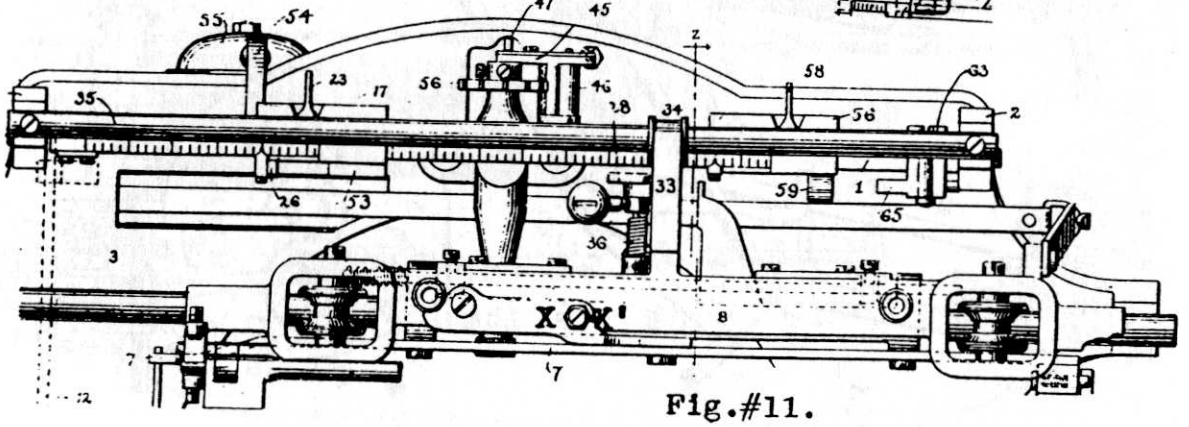
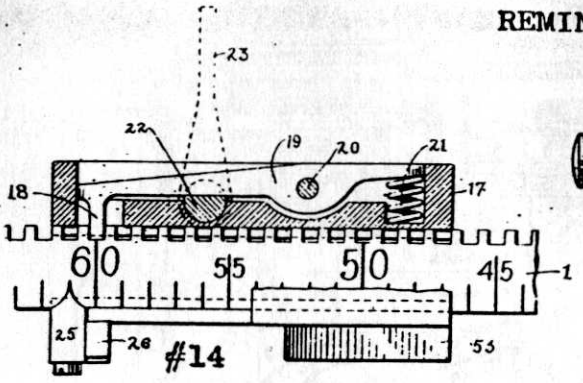
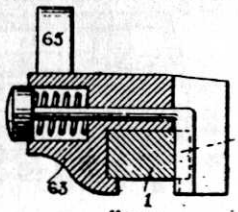


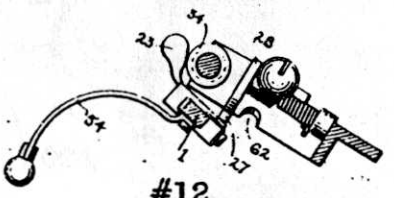
Fig.#11.



#14



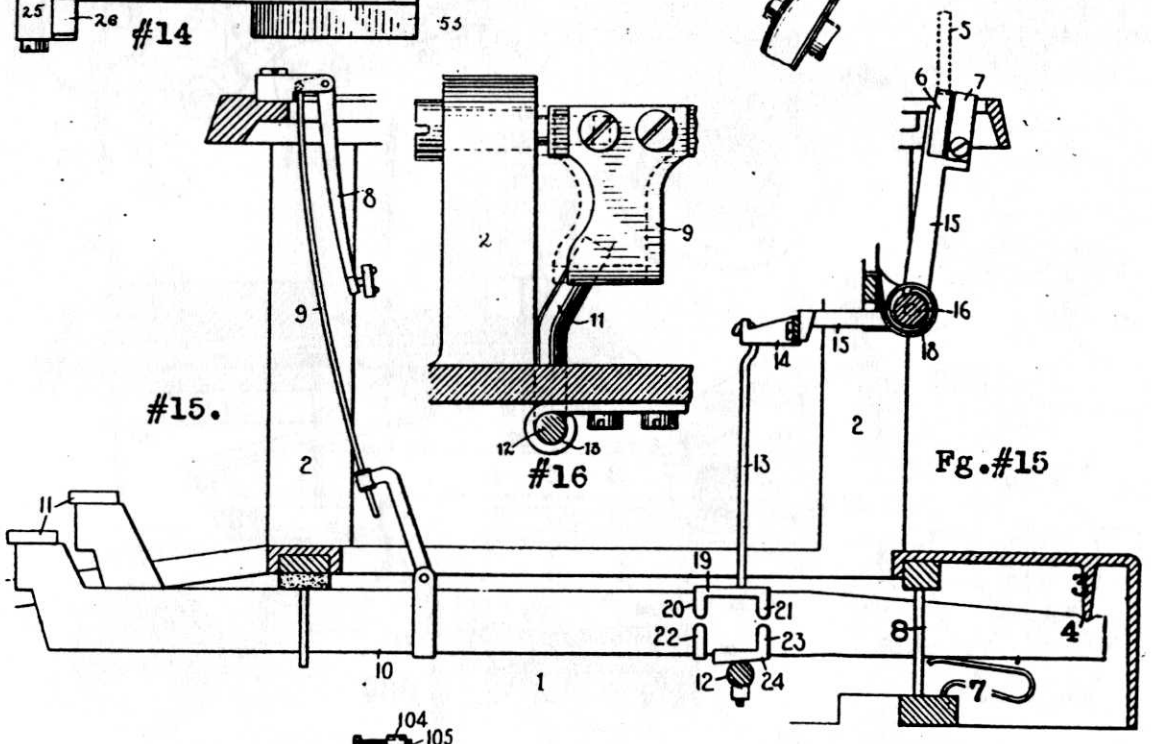
#13



#12

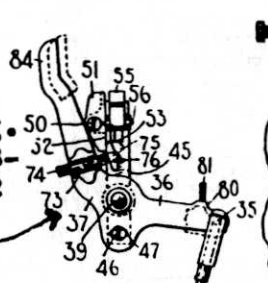
#16

#15.

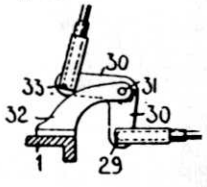


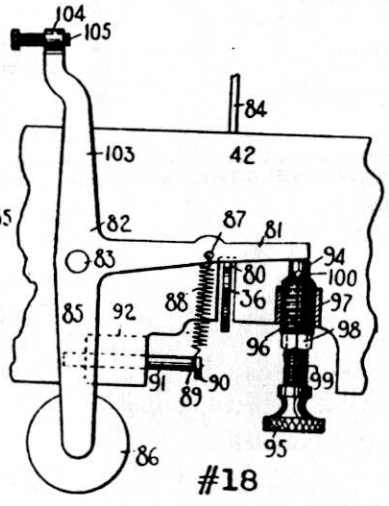
Fg.#15

See Pg. 43-C-B- Fs.1-2

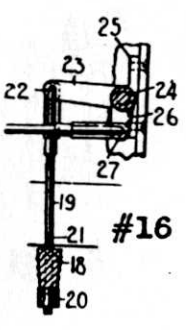


#17





#18



#16

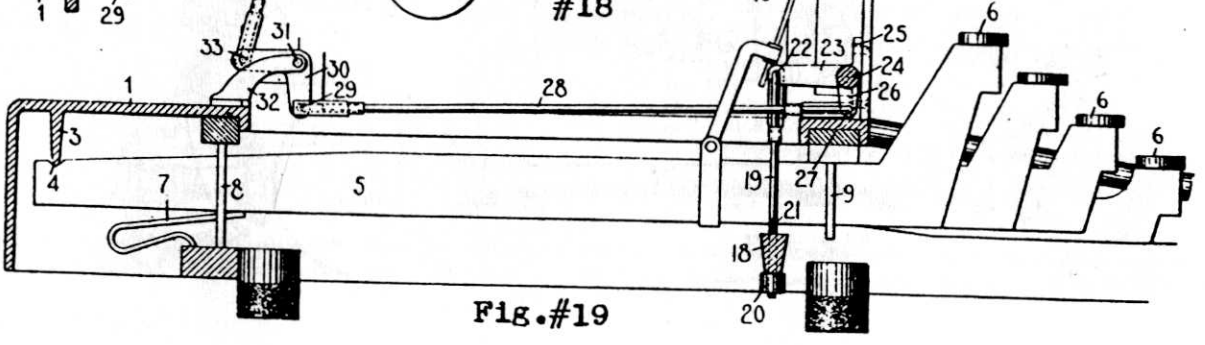
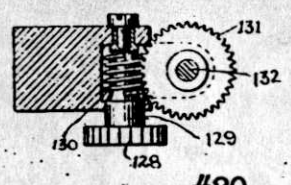
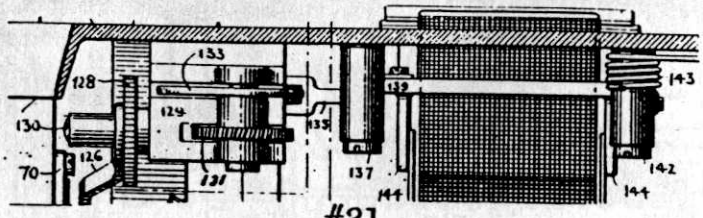


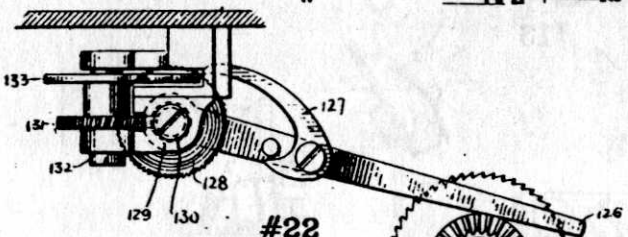
Fig.#19



#20

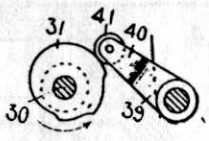


#21

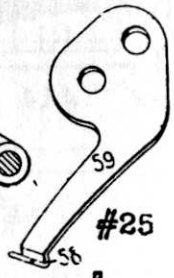


#22

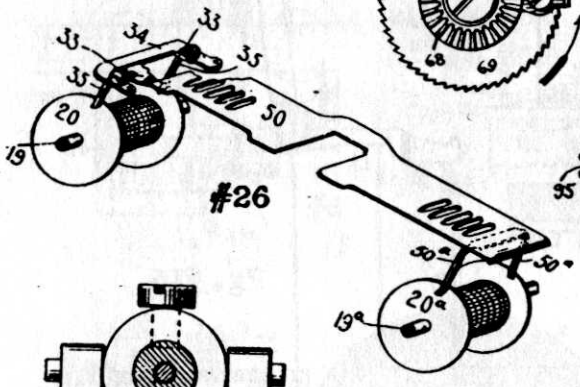
#23



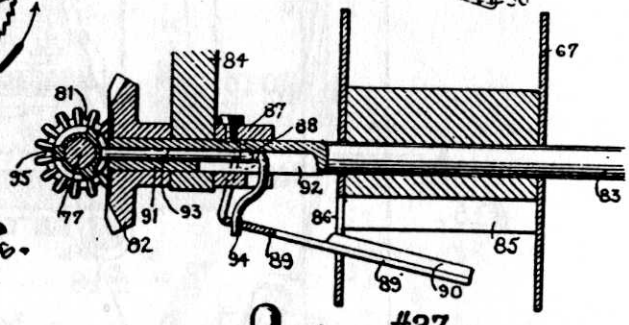
#24



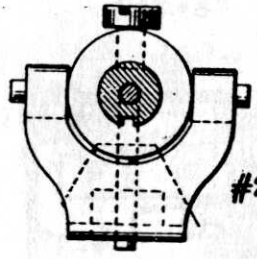
#25



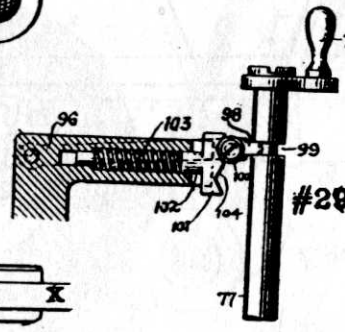
#26



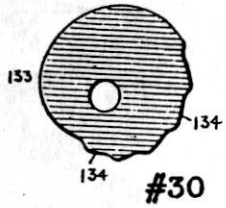
#27



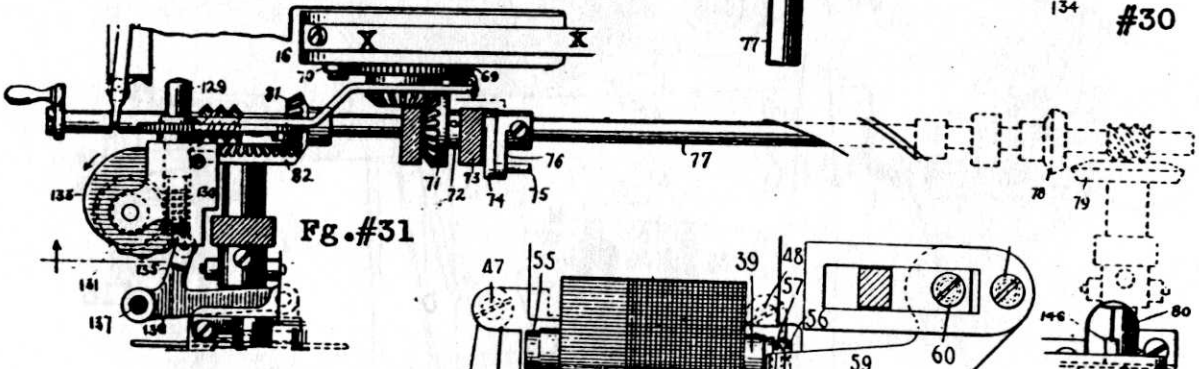
#28



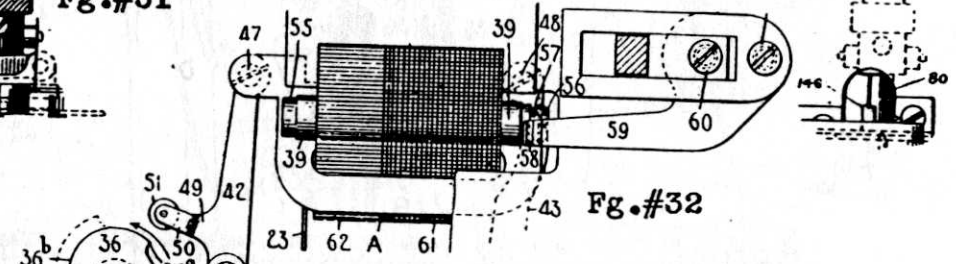
#29



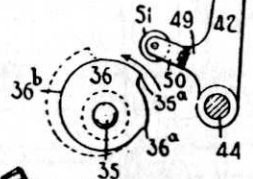
#30



Fg.#31



Fg.#32



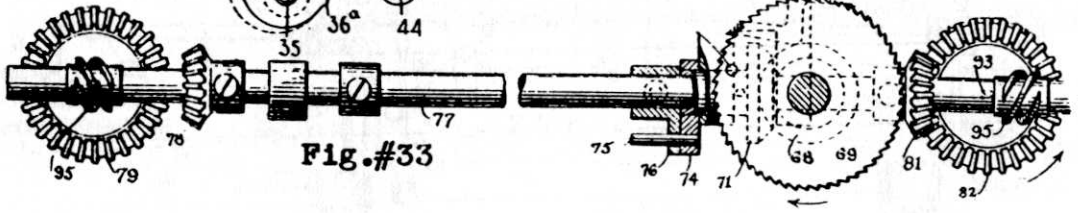
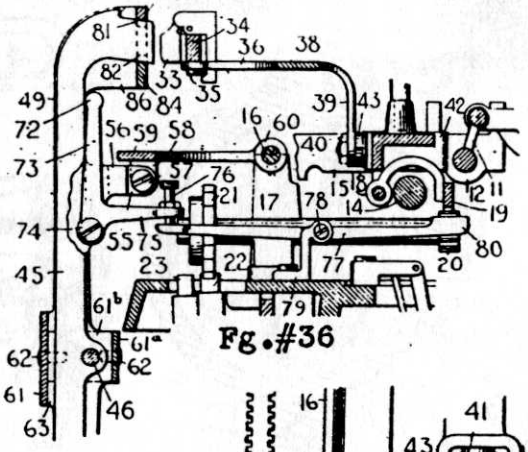
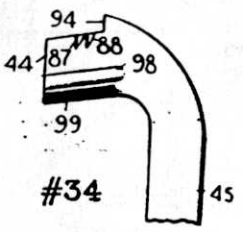


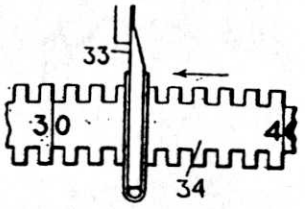
Fig.#33



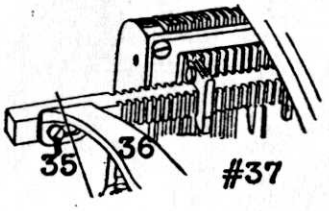
Fg.#36



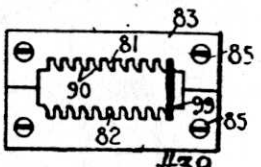
#34



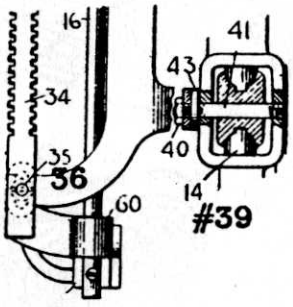
#35



#37

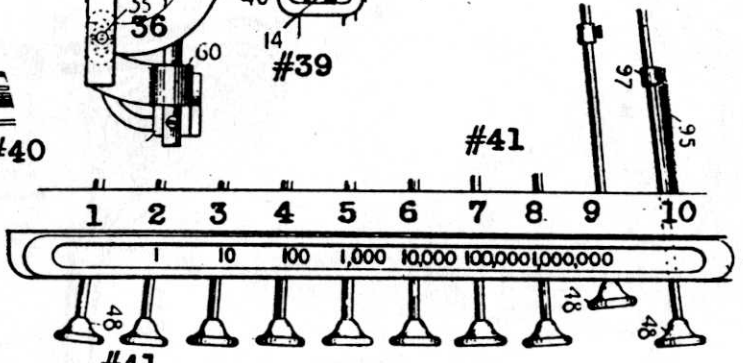


#38

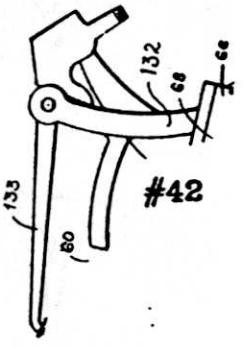


#39

#40

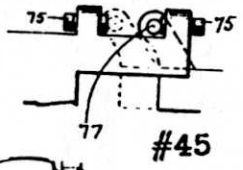


#41



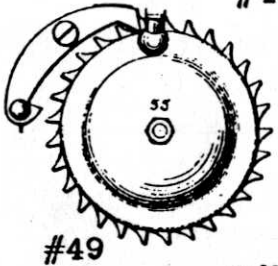
#42

#43

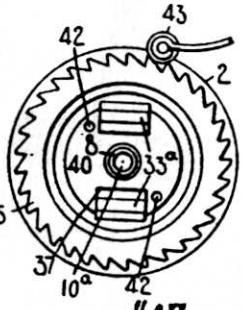


#45

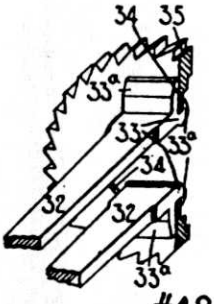
#44



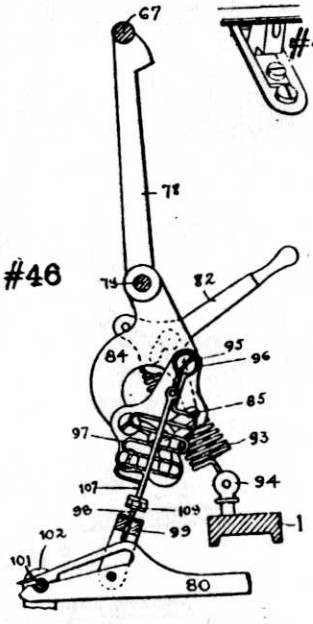
#49



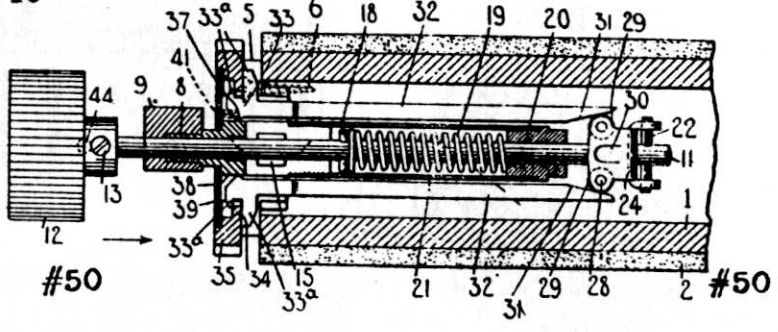
#47



#48



#46



#50

Fig.#51

SMITH PREMIER VISIBLE #10-11. Pg.#22.

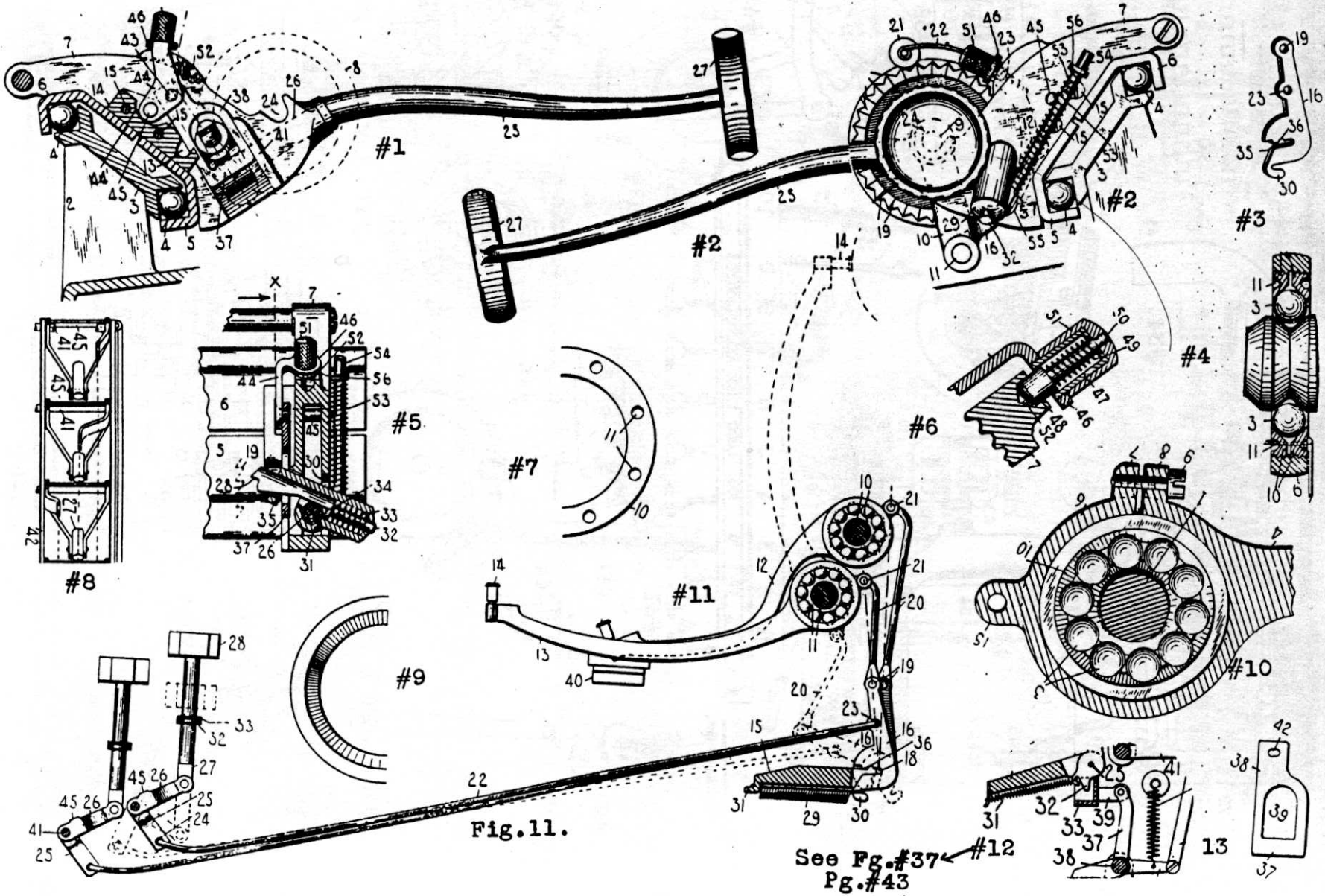


Fig.11.

See Fg.#37 Pg.#43

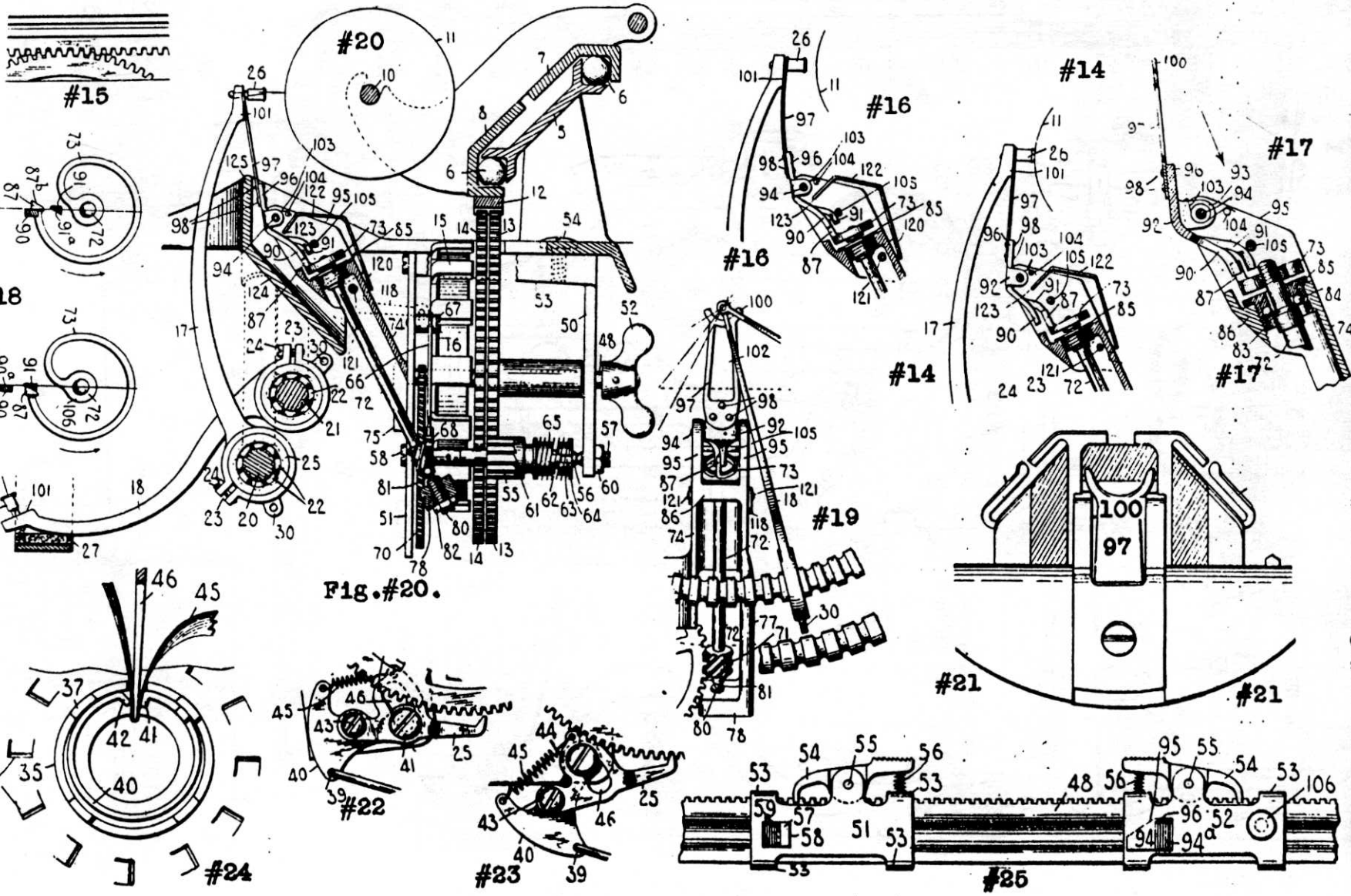
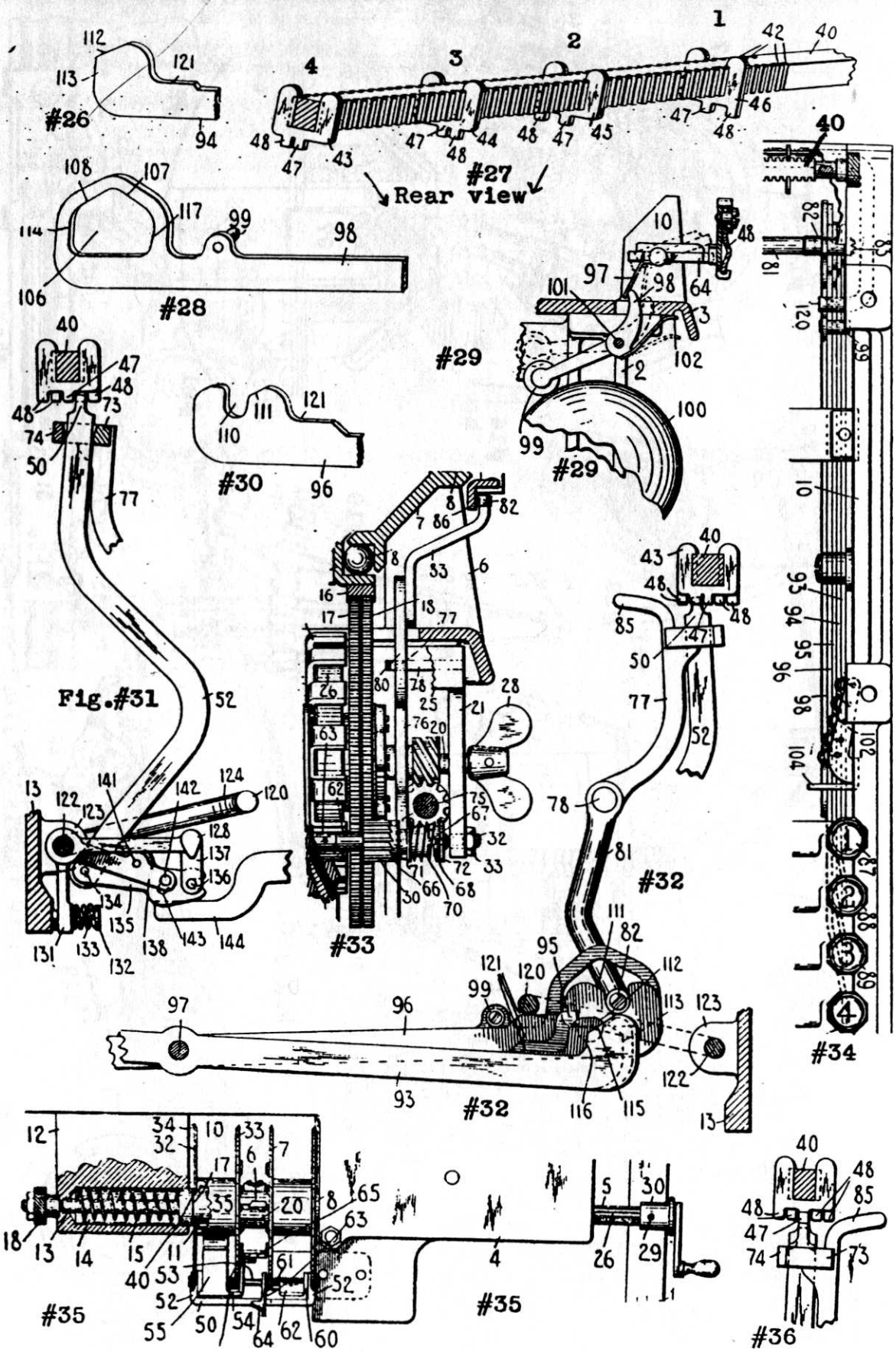
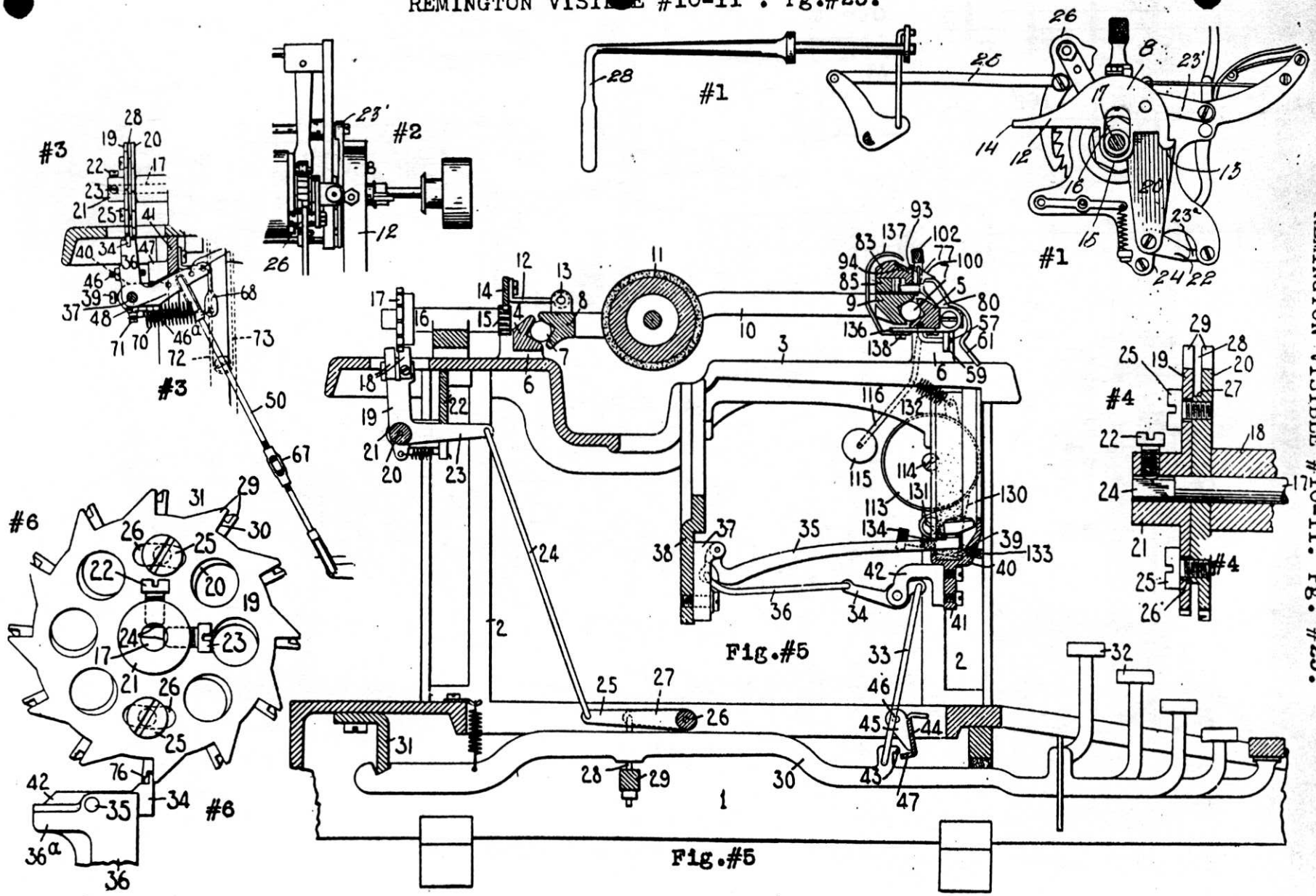
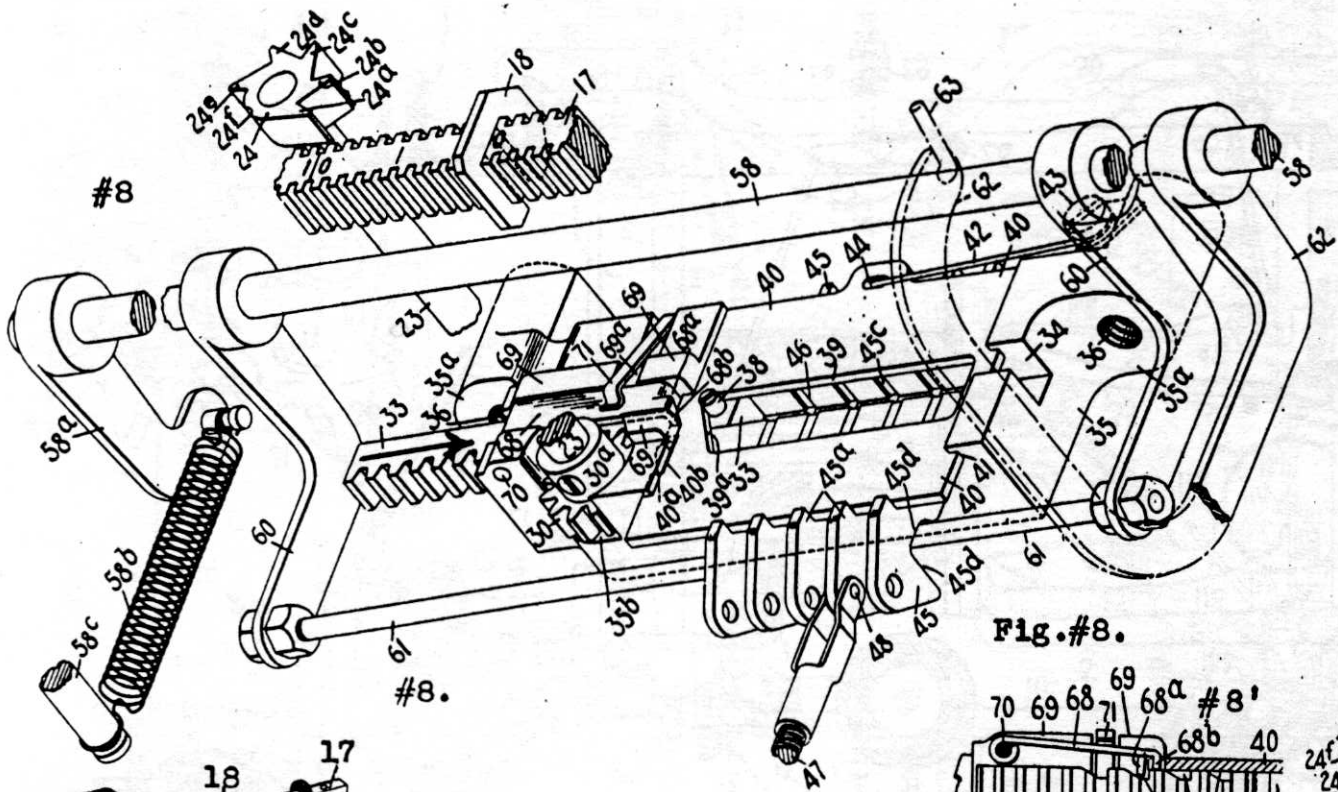


Fig.#20.


#26
#27
Rear view
#28
#29
#30
Fig.#31
#32
#33
#34
#35
#36



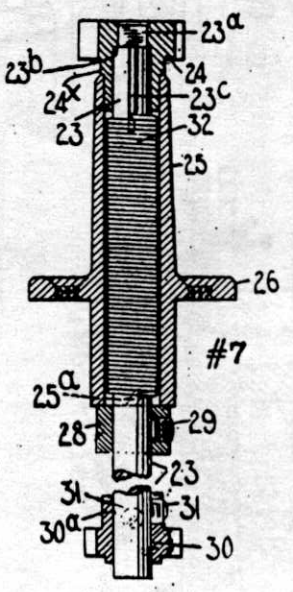
REMINGTON VISIBLE #10-11. Pg. #25.



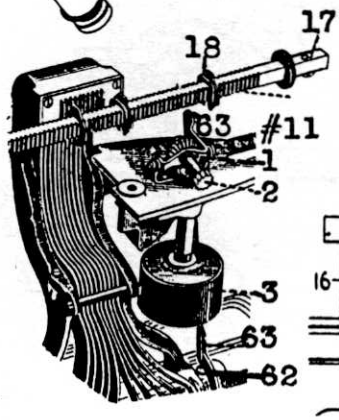
#8.

Fig.#8.

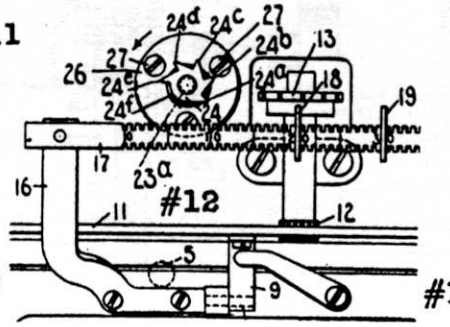
For side view of F.8
see F.#8"-Pg.#43



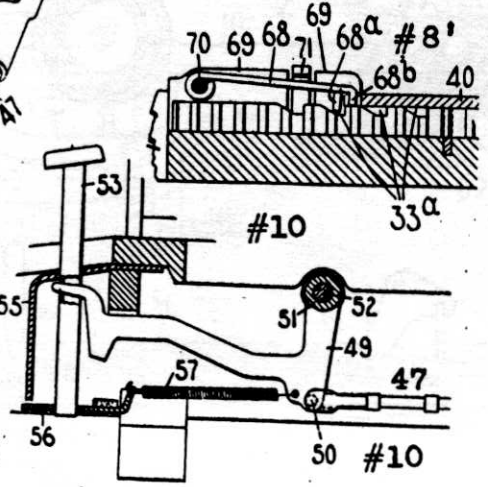
#7



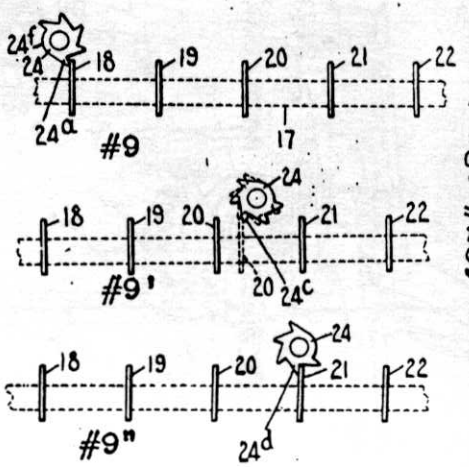
#11



#12



#10



#9 #9' #9"

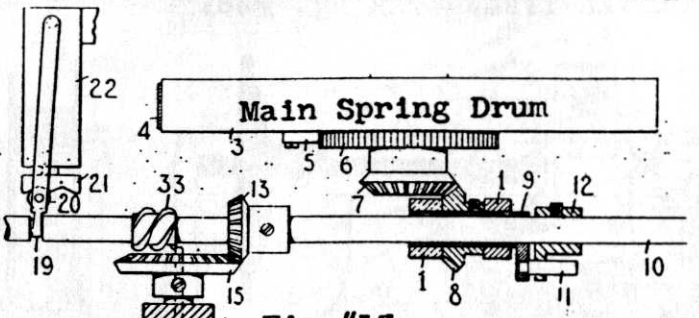
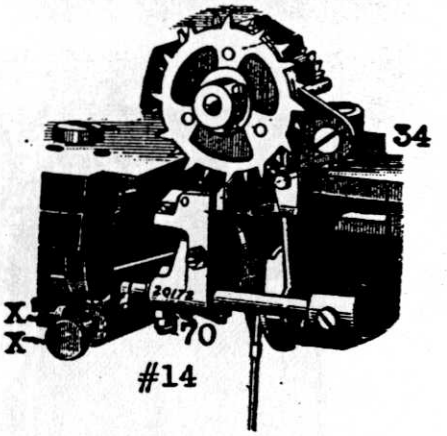
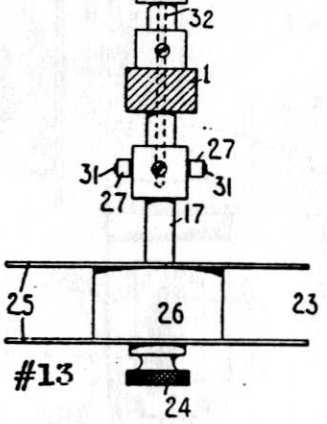


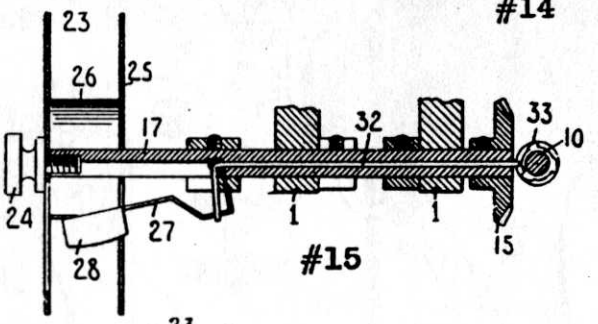
Fig.#13



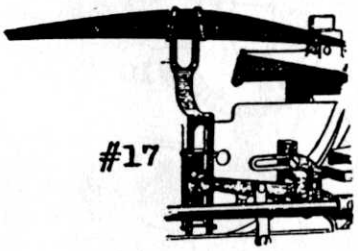
#14



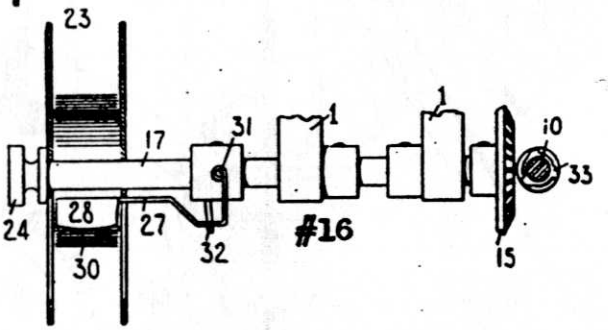
#13



#15



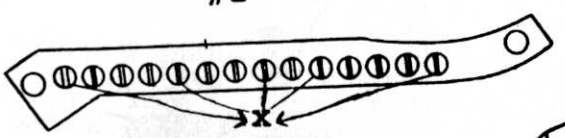
#17

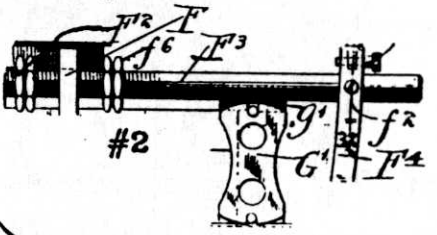


#16

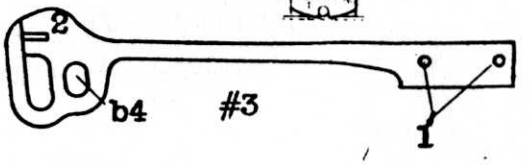
OLIVER TYPEWRITER #3&5

#1

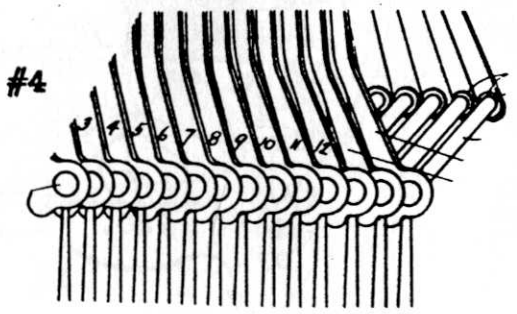




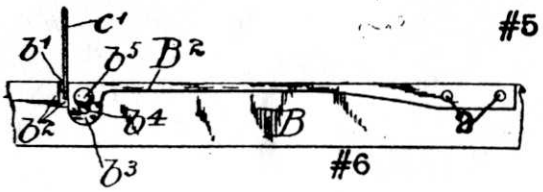
#2



#3

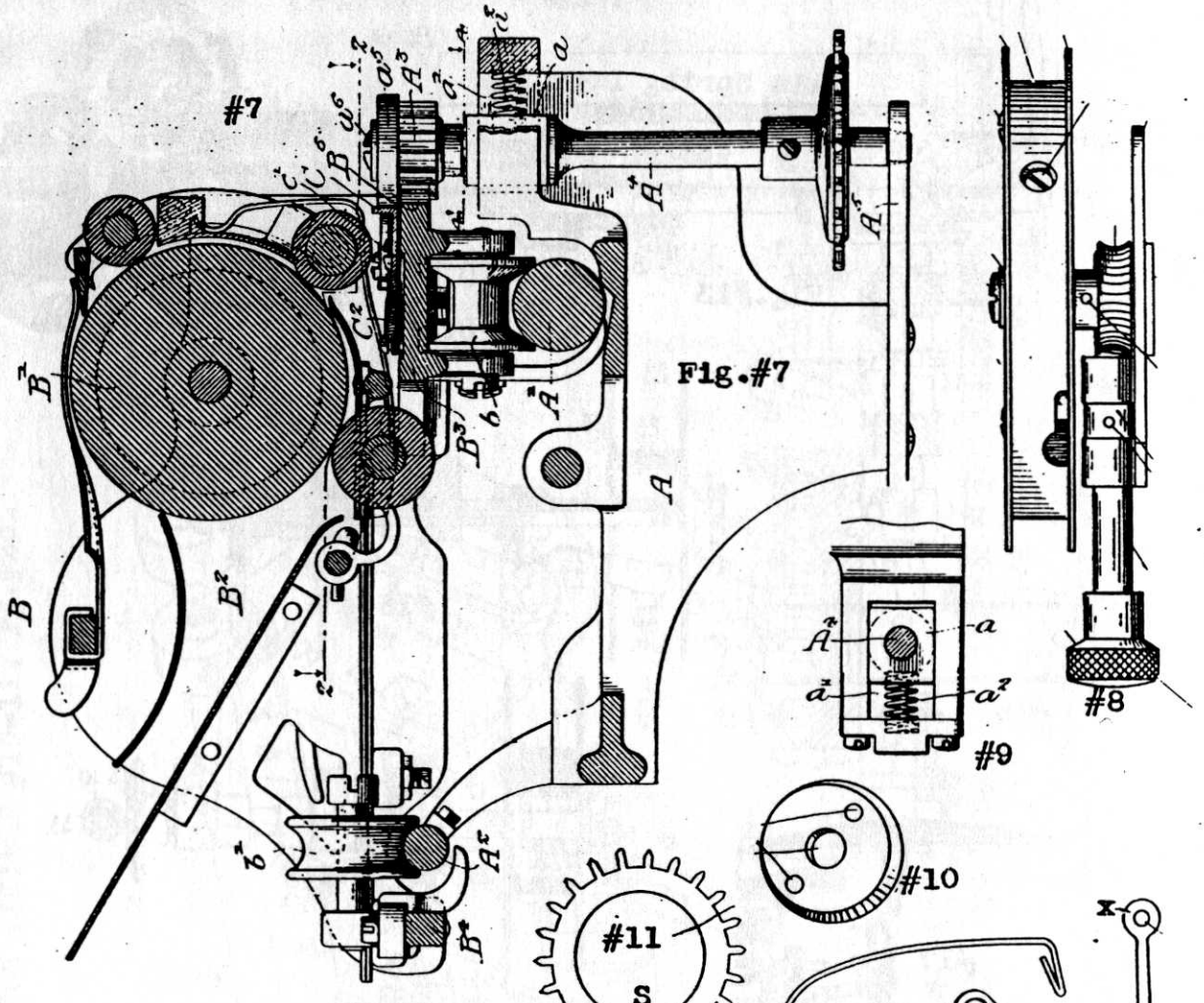


#4

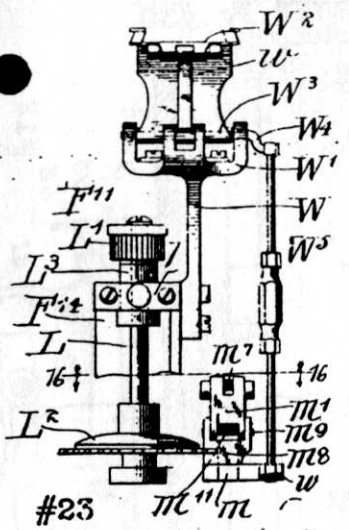


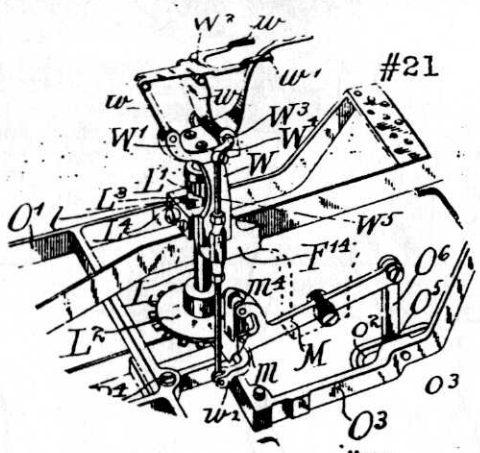
#6

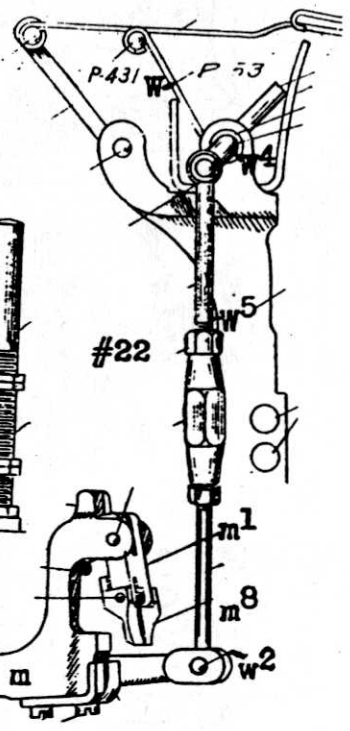
#5


#7
Fig.#7
#8
#9
#10
#11
S
#12
#13
#14
#15
#16
#16
#17
#18
#18
#19
S2
#20.
1
2
3
x
x'

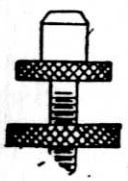
OLIVER TYPEWRITER Pg. #29.

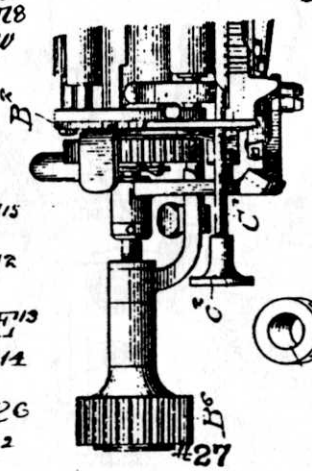

#23

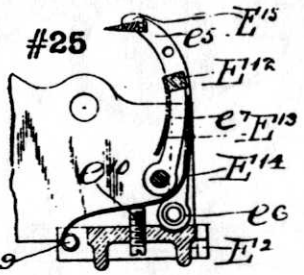

#21

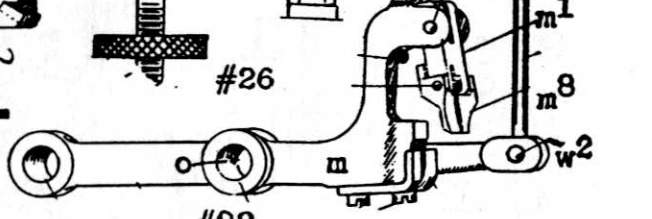

#22

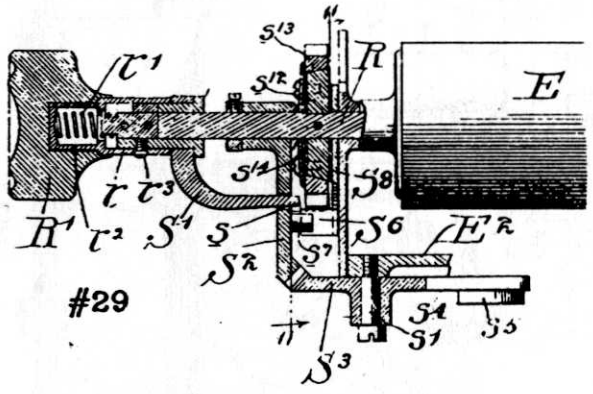
#24

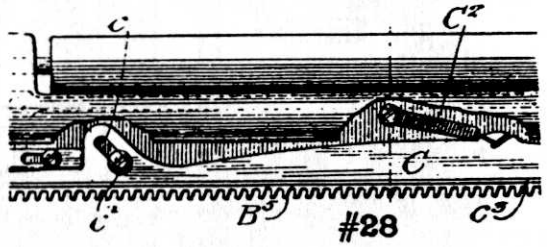

#26

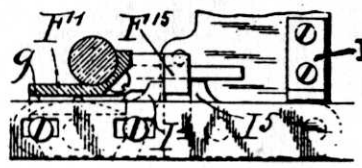

#27


#25

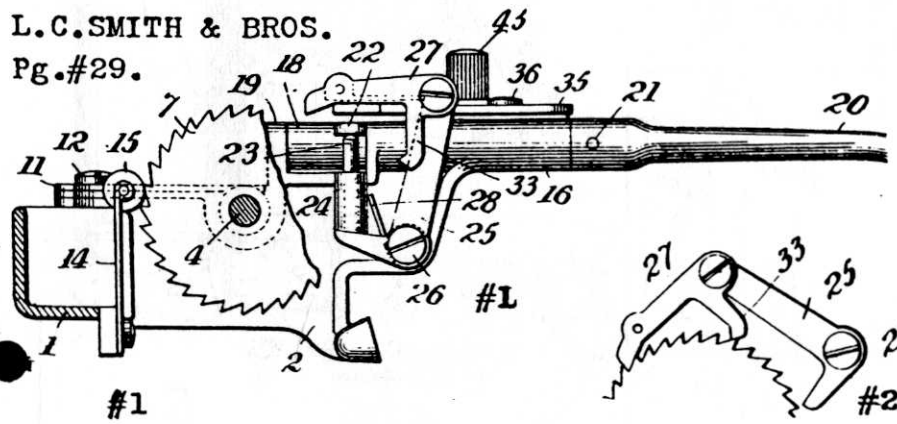

#22

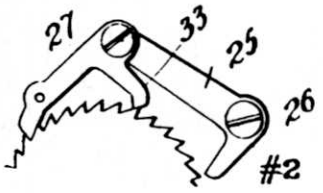

#29

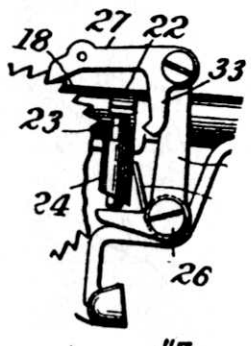

#28

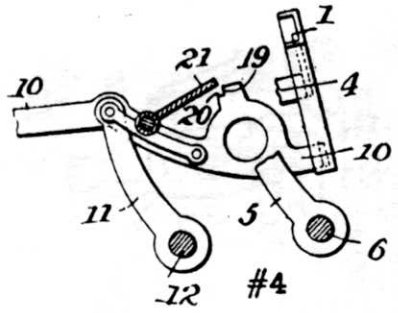

#30

L.C.SMITH & BROS.
Pg.#29.

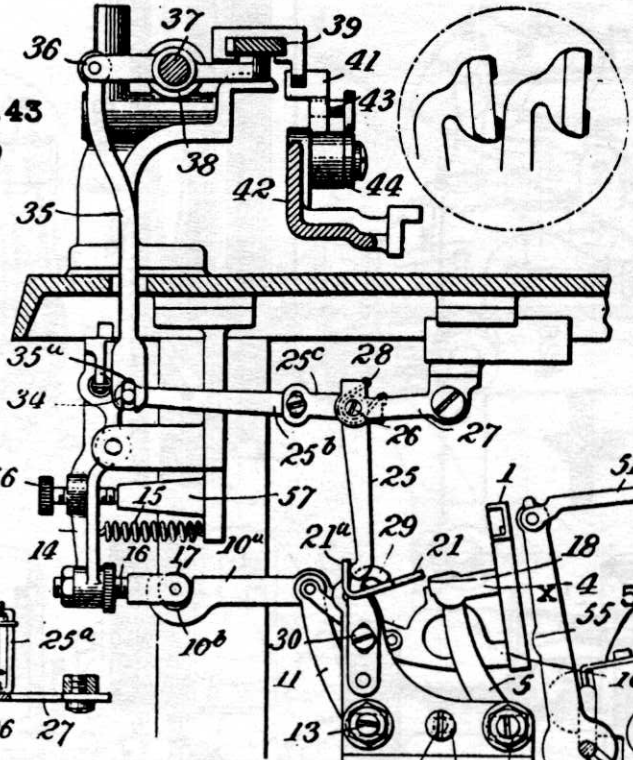

#1

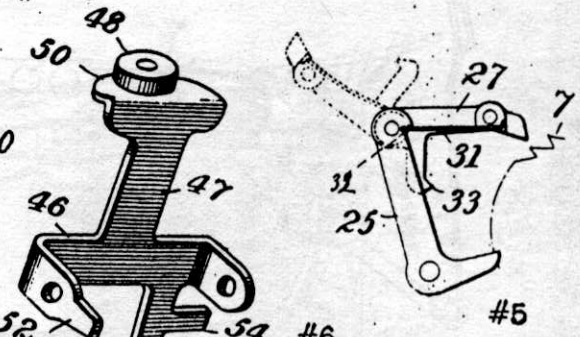

#2

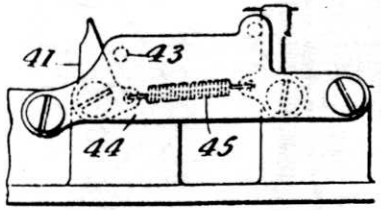

#3

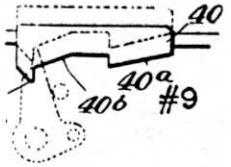


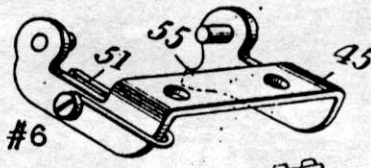
See Pg.43
Fig.#19











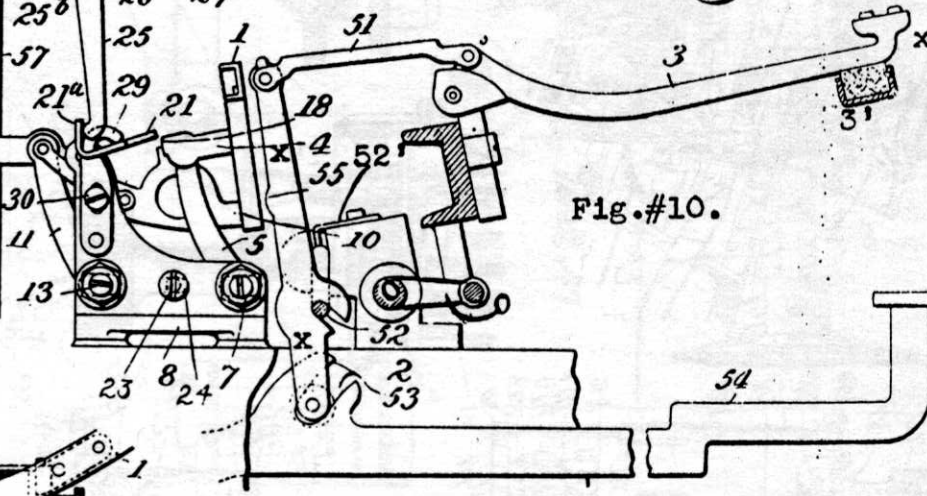
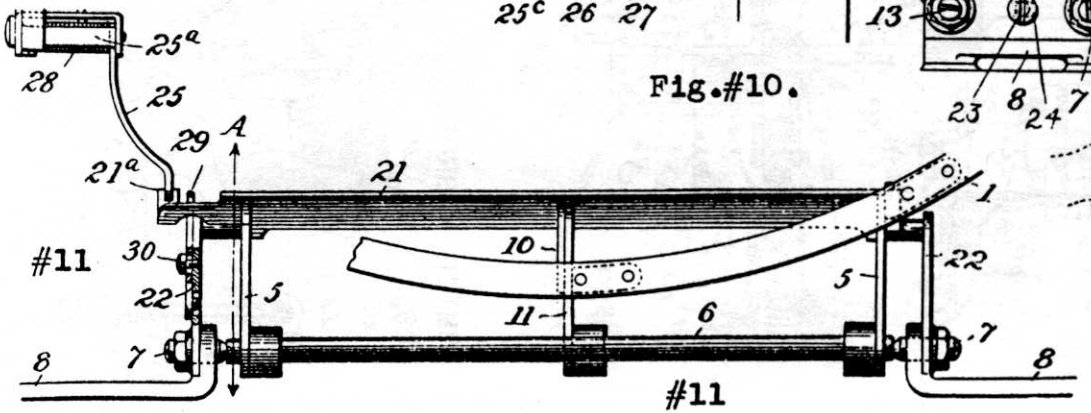
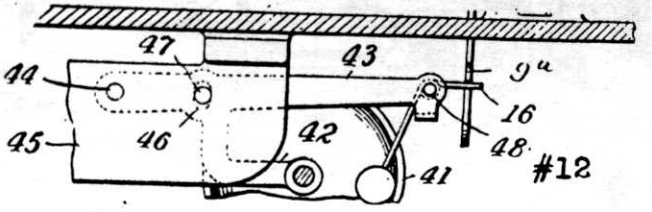


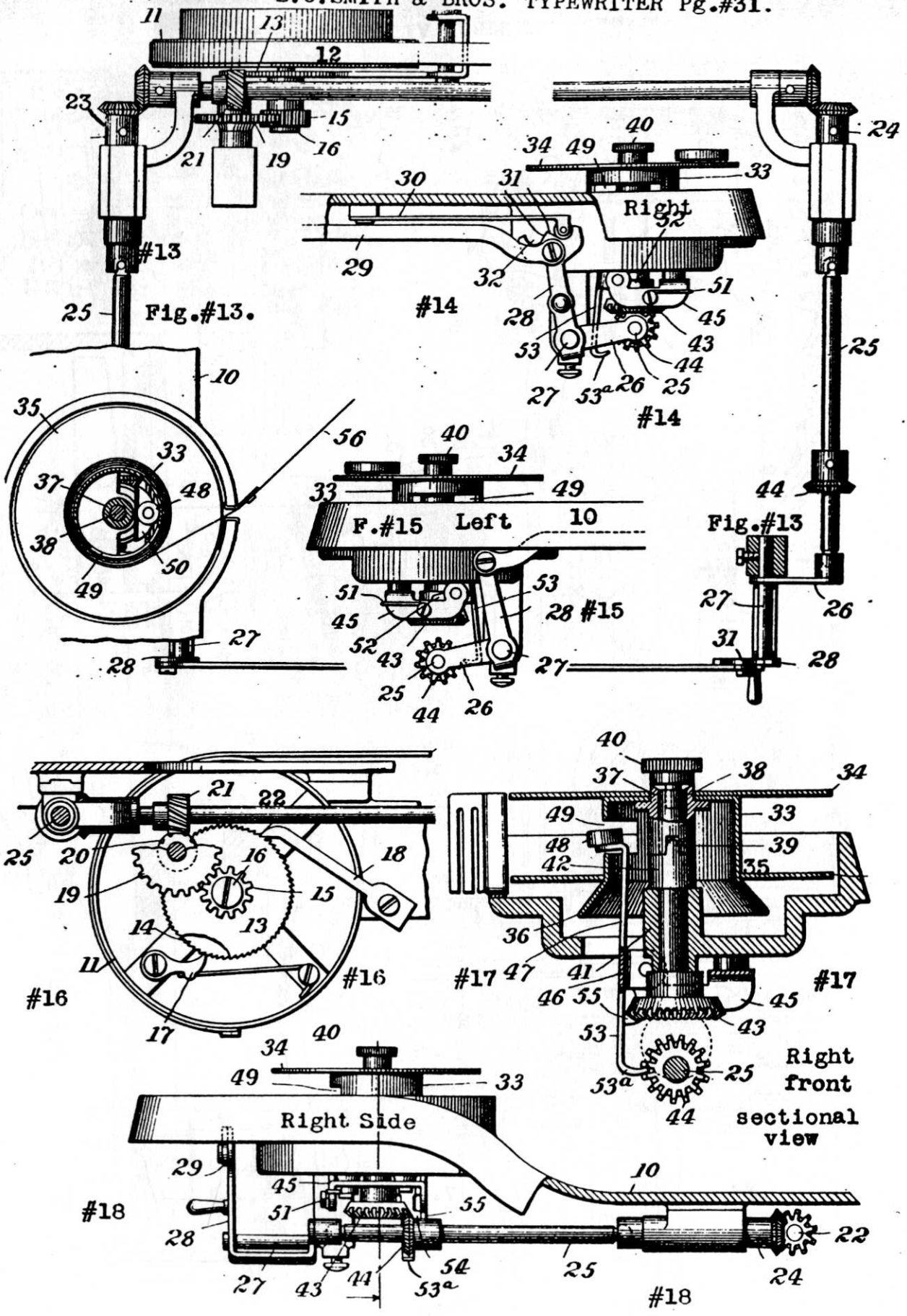
Fig.#10.

Fig.#10.



#11




#13
Fig.#13.
#14
Right
#14
F.#15 Left
#15
Fig.#13
#16
#16
#17
#17
Right front sectional view
Right Side
#18
#18

MONARCH VISIBLE Pg.#32.

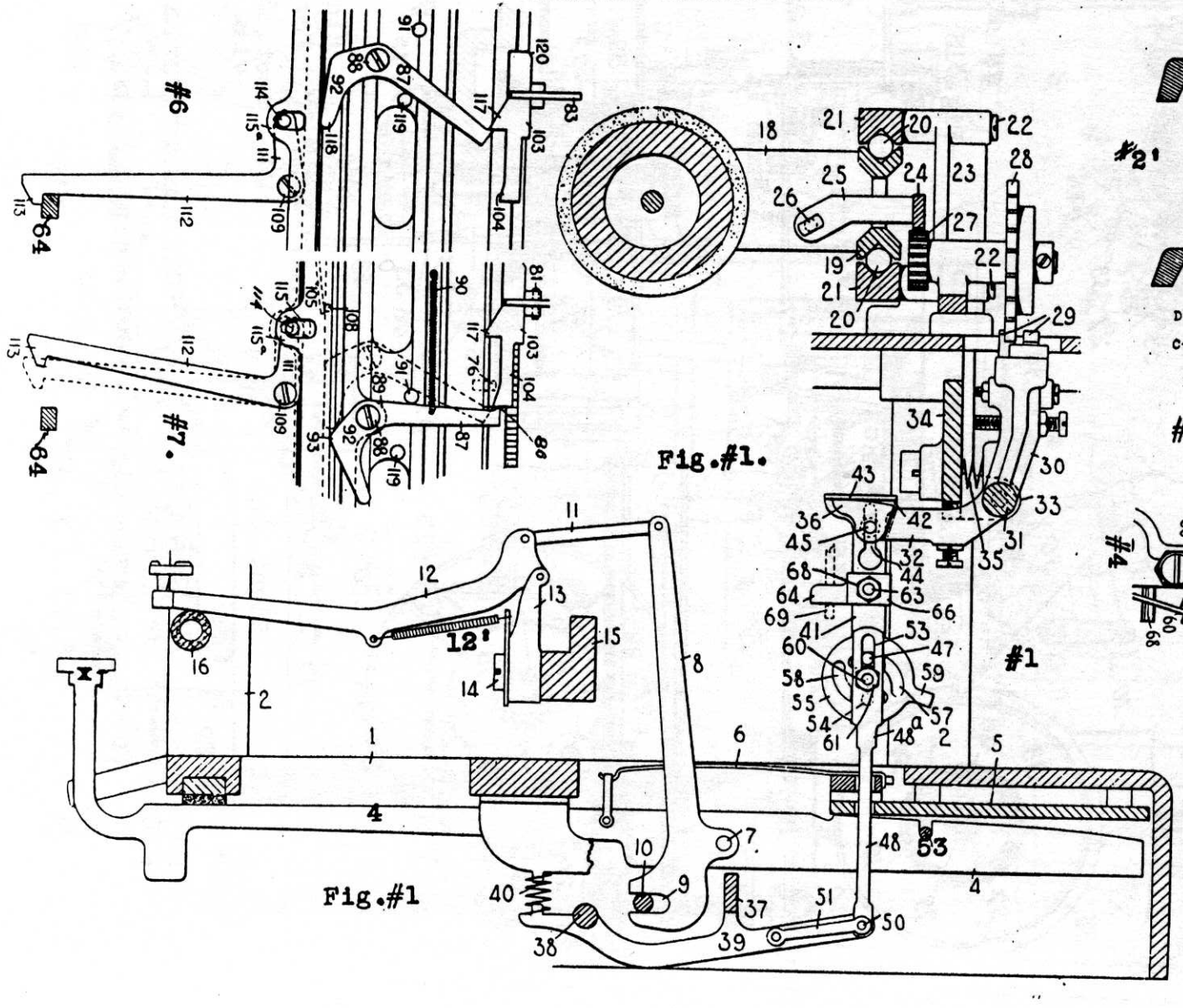
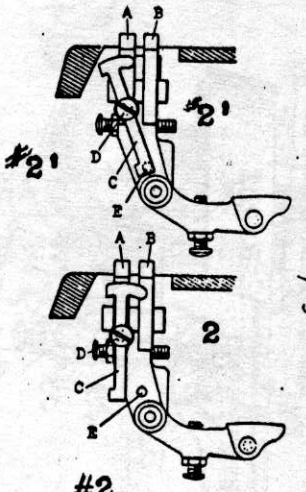


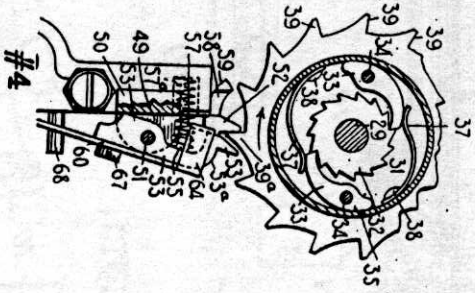
Fig.#1

#6 #7.

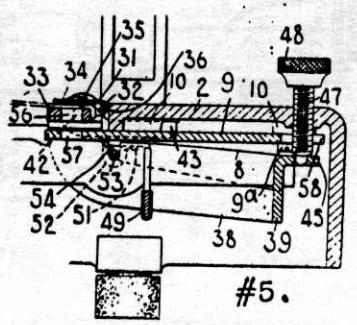
Fig.#1.



#2' #2 #3



#4



#5.

MONARCH VISIBLE Pg.#32.

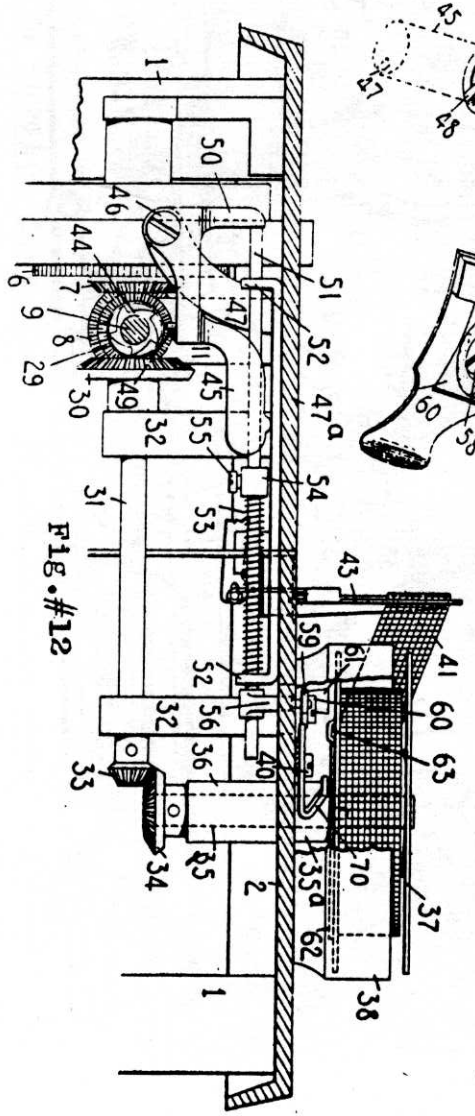
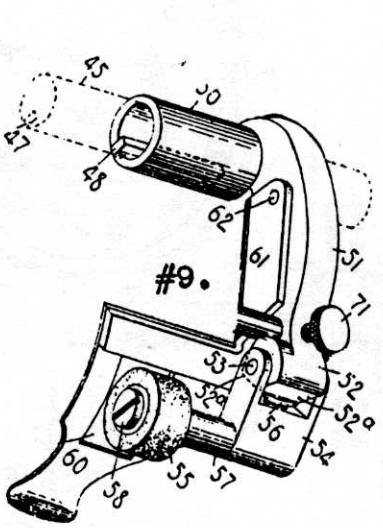
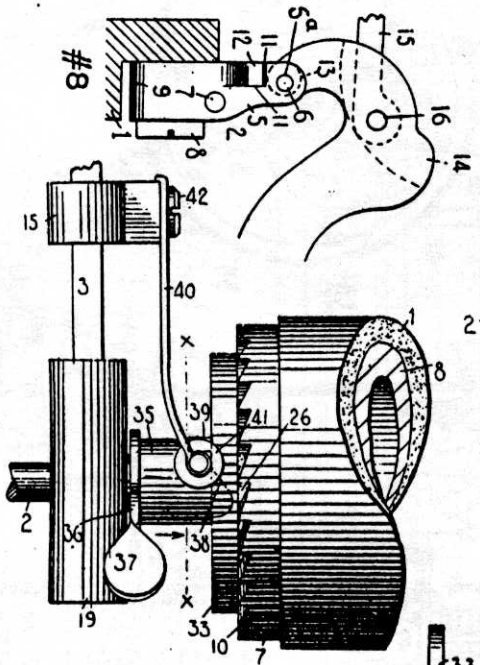


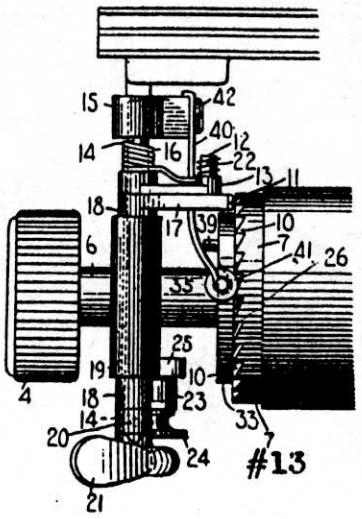
Fig.#12



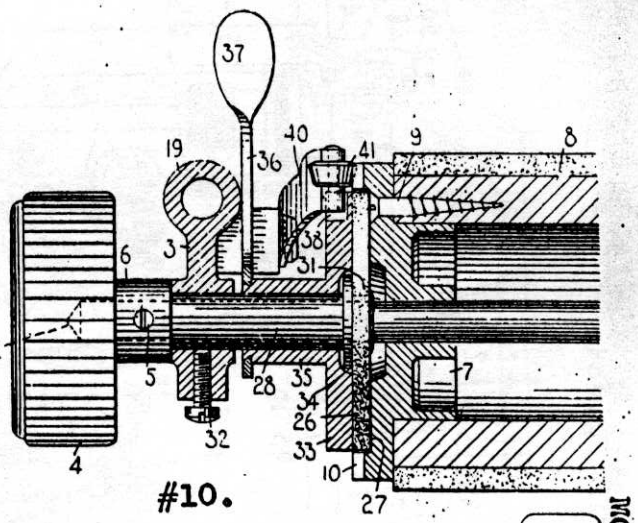
#9.



#11



#13



#10.

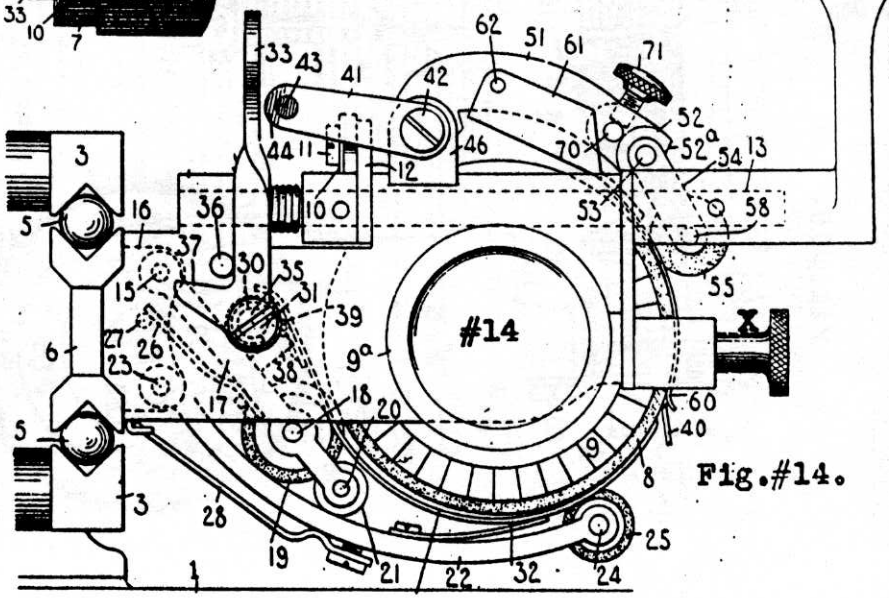
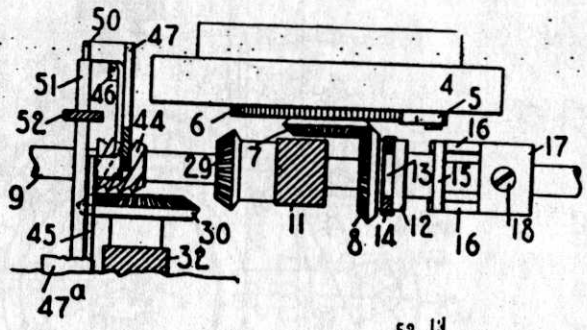
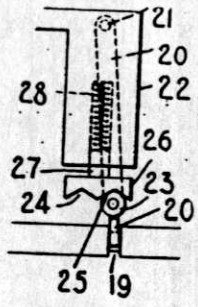


Fig.#14.

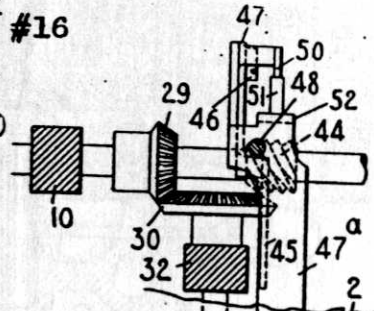
Fig.#15.



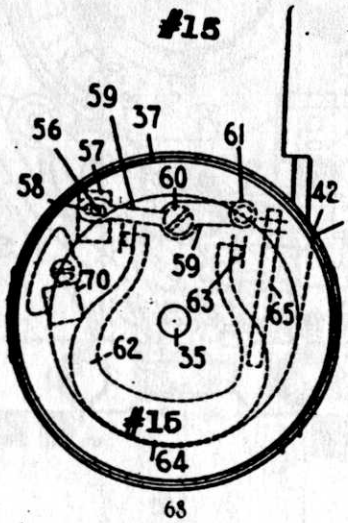
#15



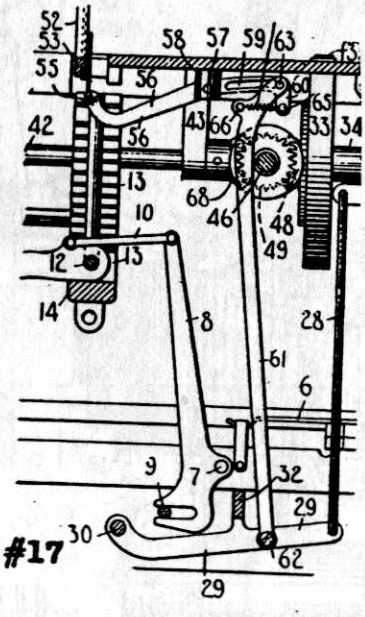
#16



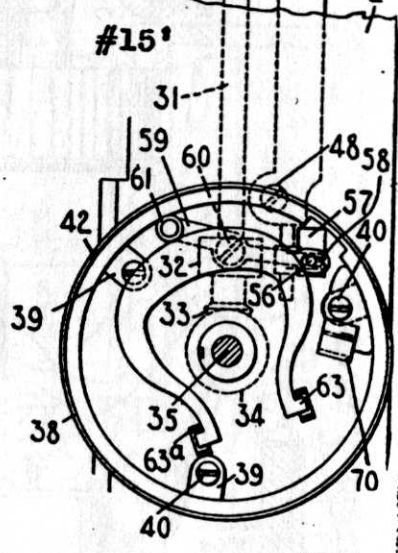
#16



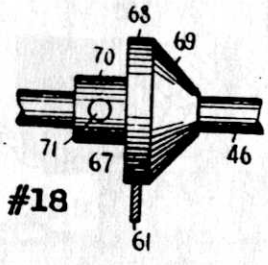
#15



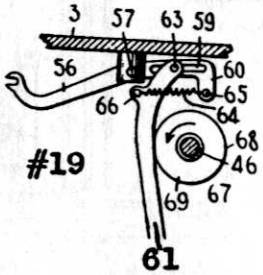
#17



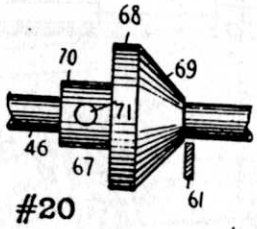
#15'



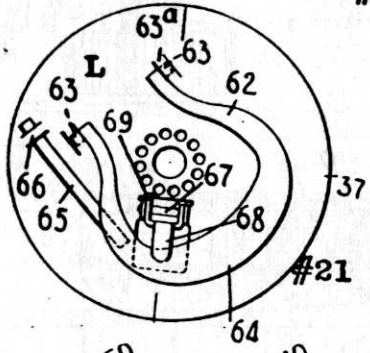
#18



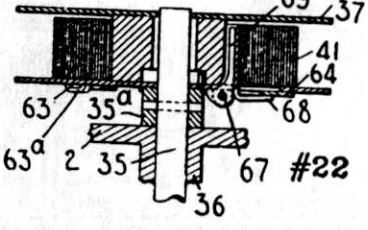
#19



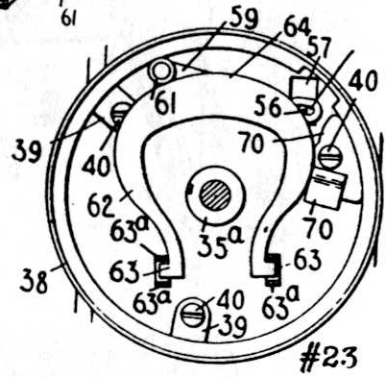
#20



#21



#22



#23

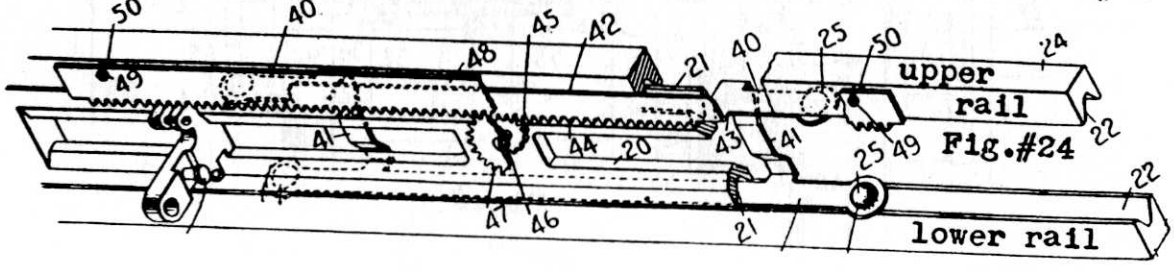


Fig.#24

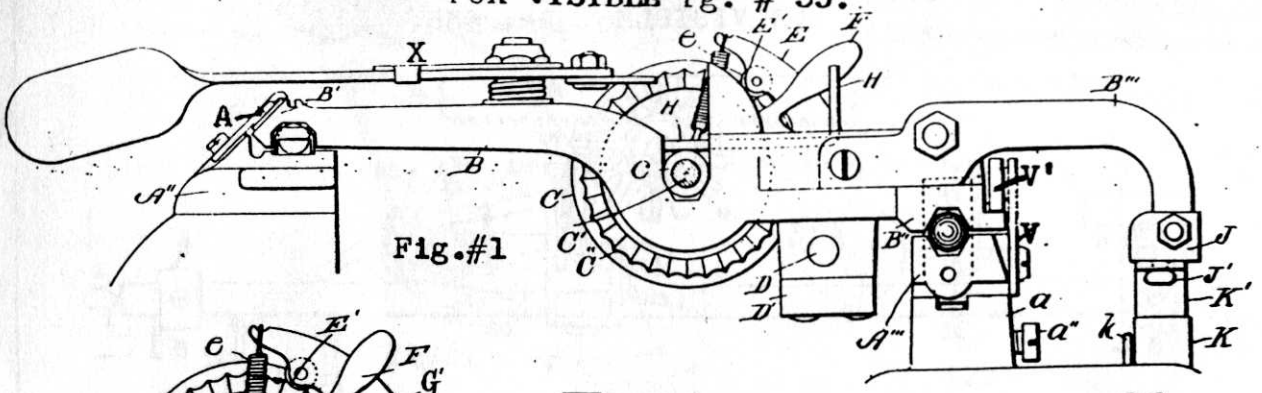
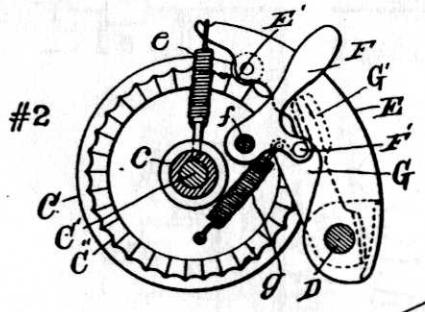
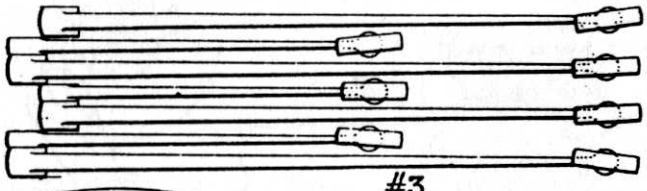


Fig.#1



#2



#3

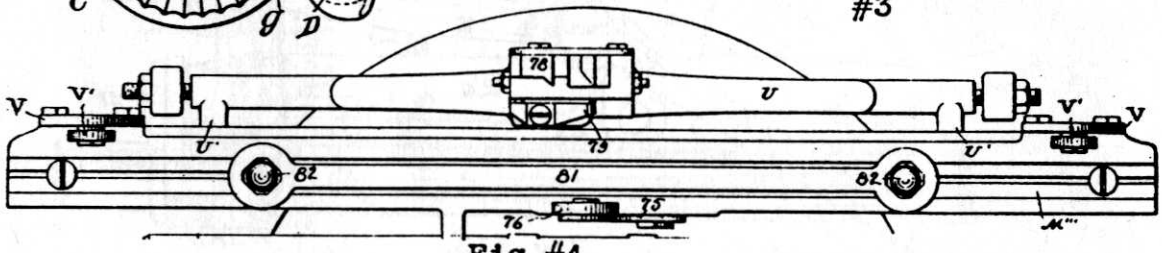
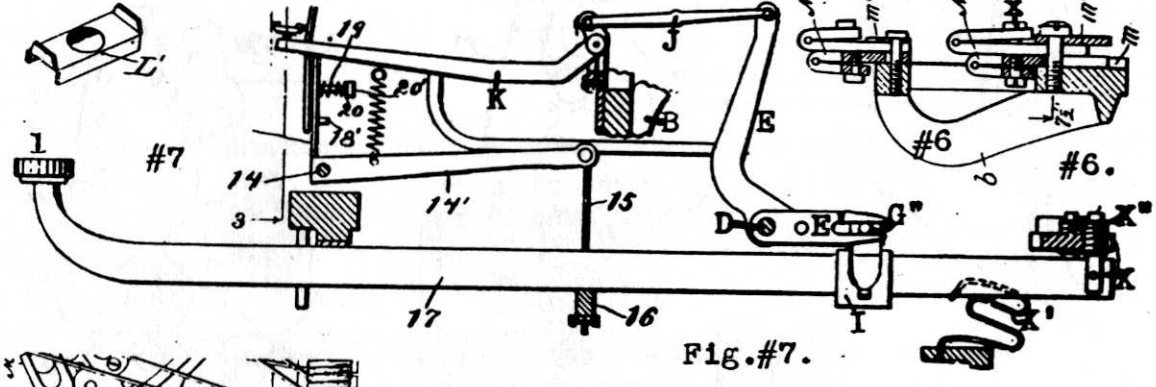
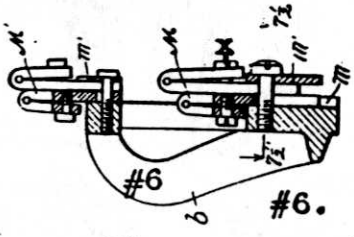


Fig.#4.

#5



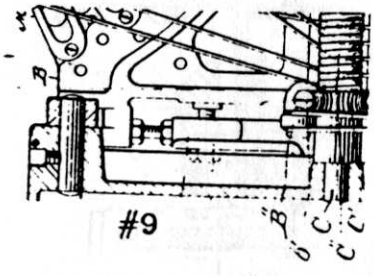
#7



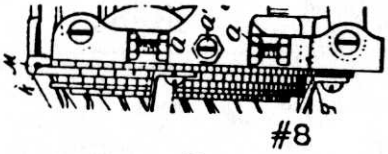
#6

#6.

Fig.#7.



#9



#8

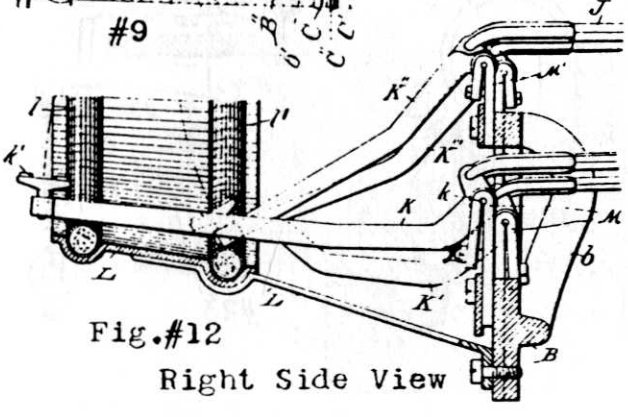
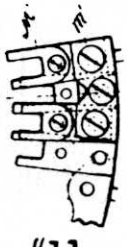
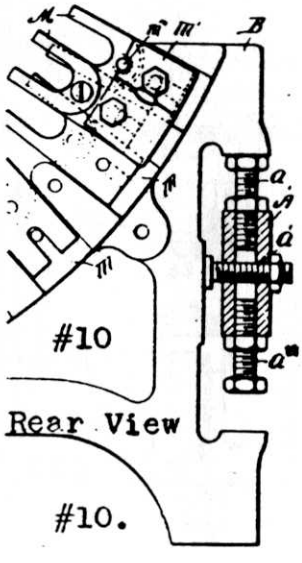


Fig.#12

Right Side View



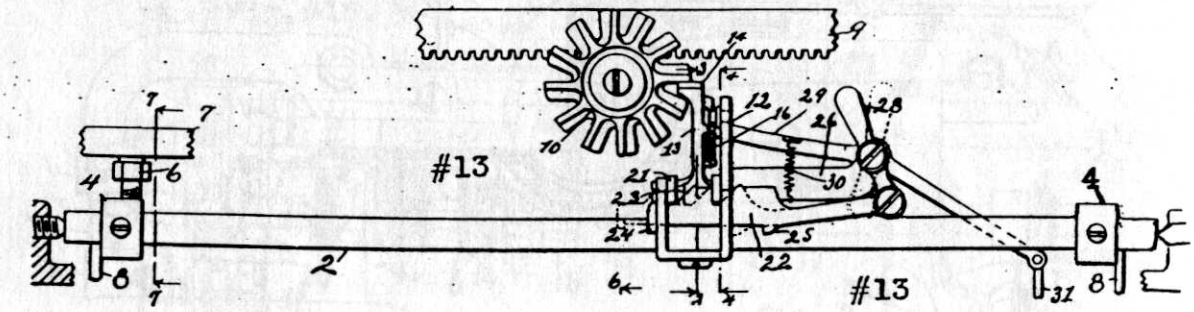
#11



#10

Rear View

#10.



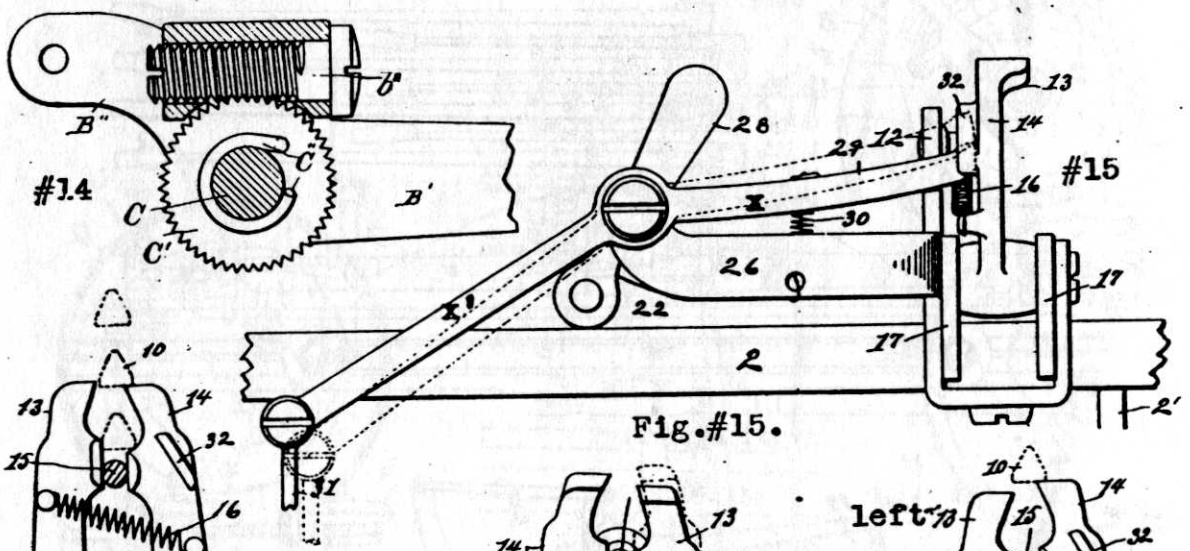
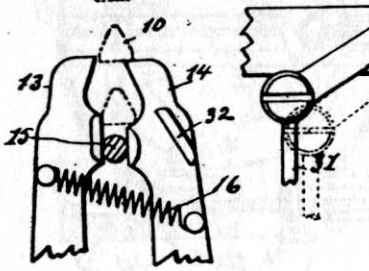
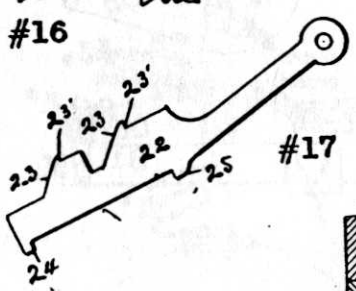
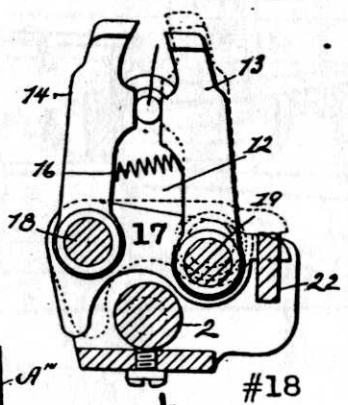
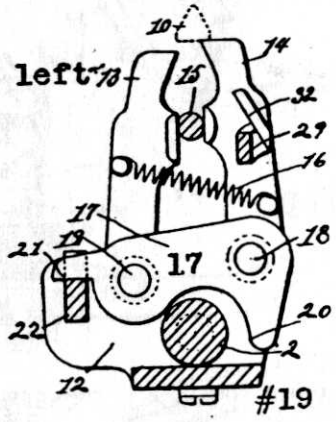


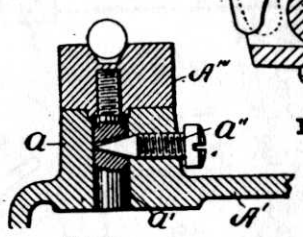
Fig.#15.

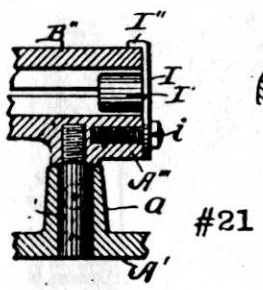


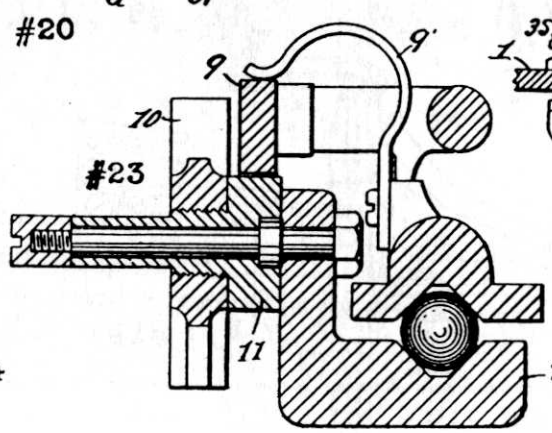


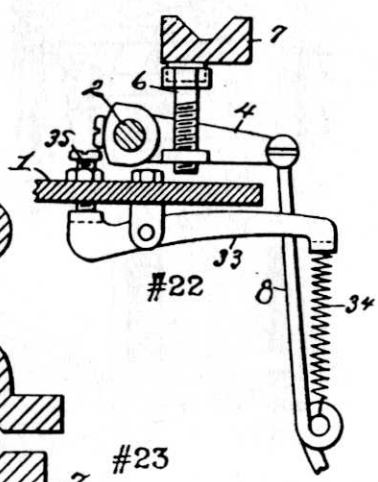


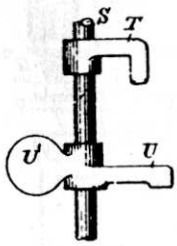


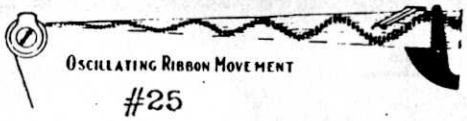












#25

#26

#27

#27'

#28

#29.

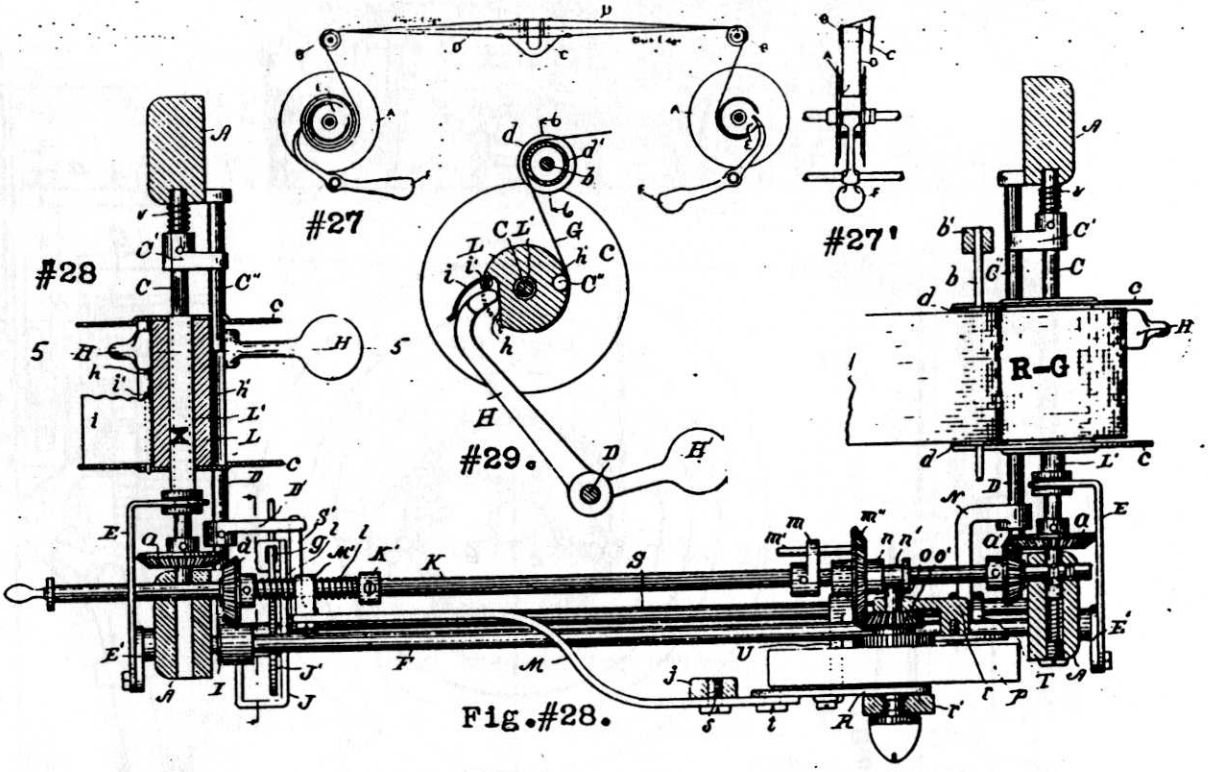


Fig.#28.

#30.

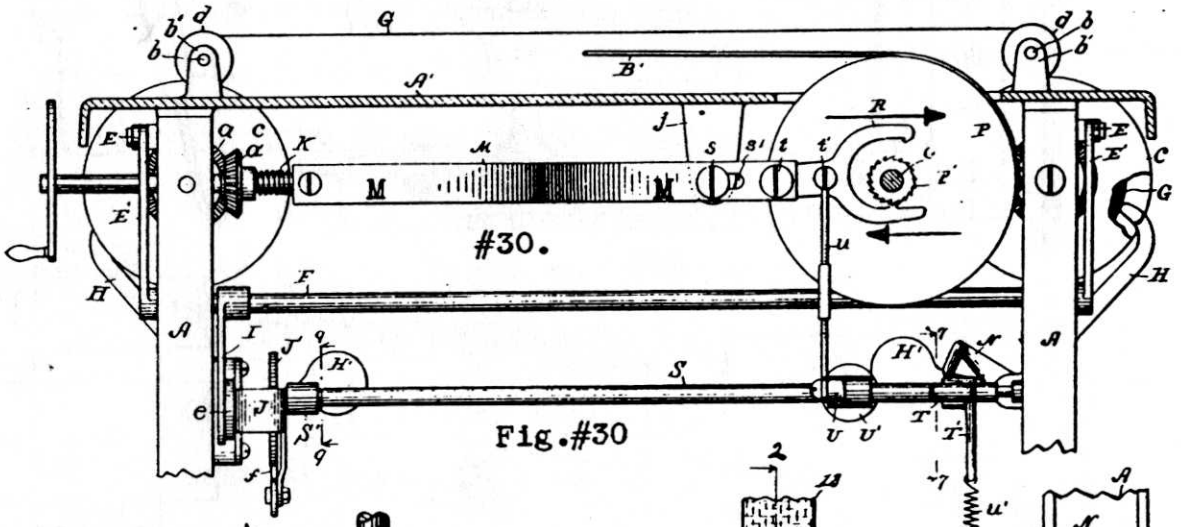
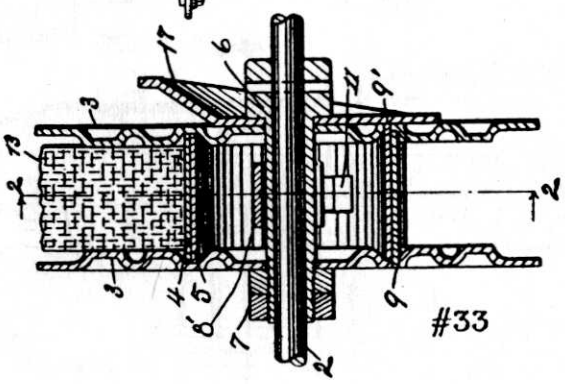
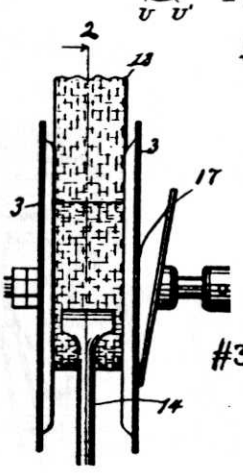


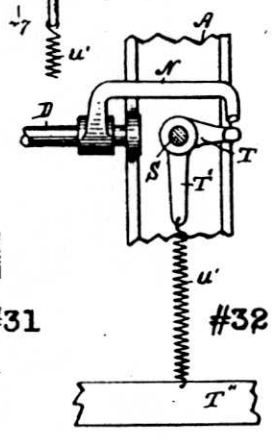
Fig.#30



#33



#31



#32

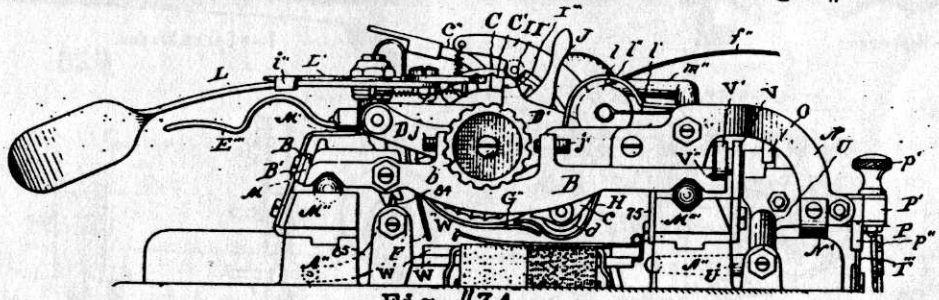
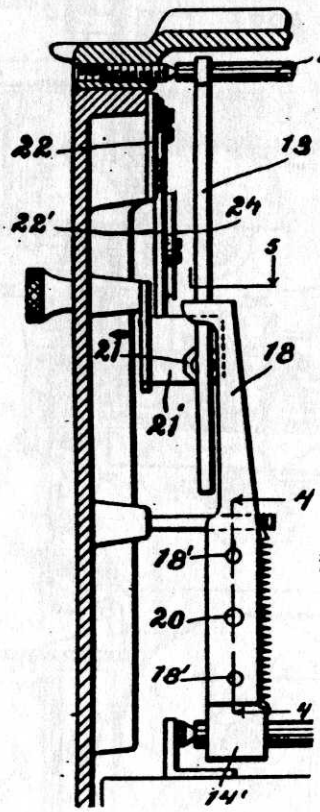
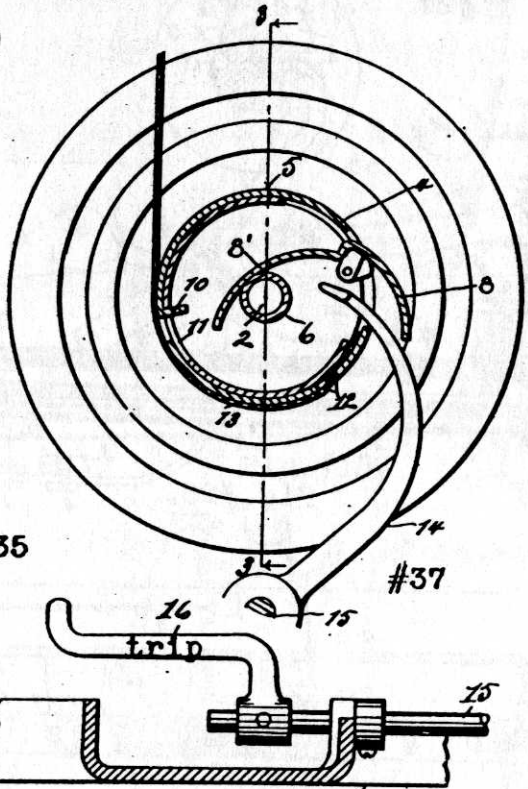


Fig.#34.

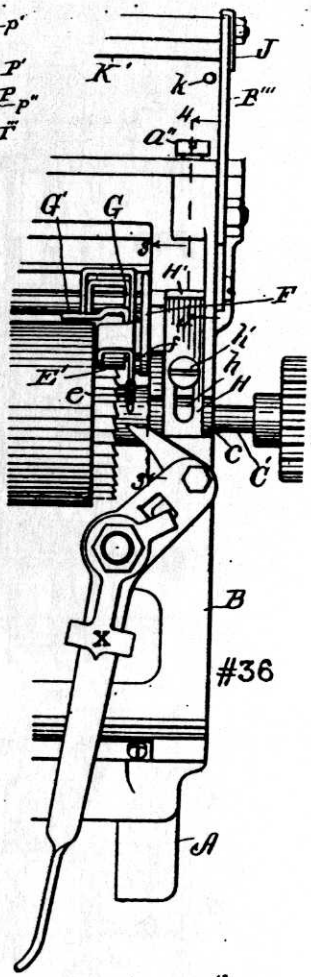


#35

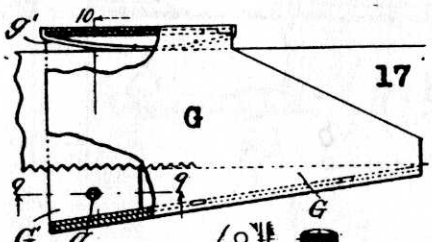


#37

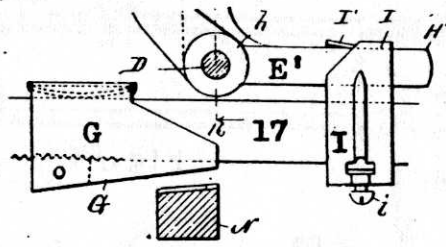
#38



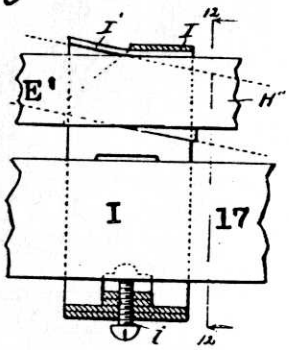
#36



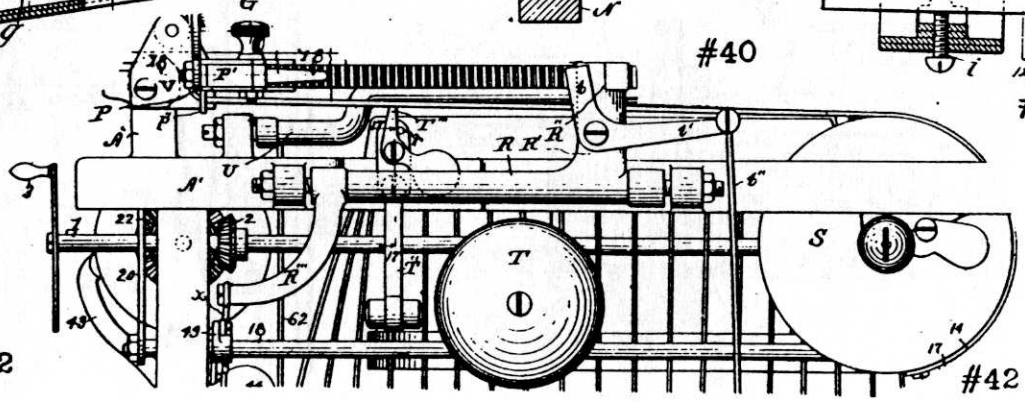
#39



#40



#41.

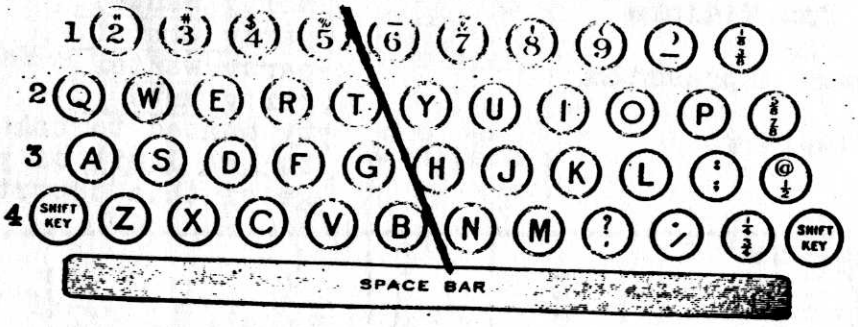


#42

#42

 VISIBLE DEFECTS -- PRINTED RESULTS. #39.

Standard Key Board



STYLES OF TYPE

PICA. Popular, standard style for correspondence and general work. Ten characters to the inch. **10 Pitch**

1,2,3,4,5,6,7,8,9,0.

ELITE. Is used largely for personal correspondence. Much matter in small space without crowded appearance.

1,2,3,4,5,6,7,8,9,0. **12 Pitch**

MEDIUM ROMAN. Very legible. Used by public speakers. Either nine or ten to inch, as desired. **10P.**

1,2,3,4,5,6,7,8,9,0. **or 9**

GOTHIC. FAVORITE FOR BILLING. USED IN COMMERCIAL AND RAIL-ROAD WORK. TEN TO THE INCH. **10P.**

1,2,3,4,5,6,7,8,9,0.

PICA GOTHIC.

A VERY LEGIBLE TYPE. A GOOD MANIFOLDER.

ELITE GOTHIC.

ALL CAPITALS, FOR BILLING. 1234567890$

M.R.GOTHIC.

ALL CAPITALS. FOR BILLING. 1234567890$ **8 Pitch.**

CONDENSED ITALIC. The work of our Condensed Italic Type. 123

CLARENDON. A shaded Roman same as VICTORIA or PRINT-TYPE

Used largely by Insurance Companies. GREAT PRIMER.

Example of perfect side and shifting alignment . Aligned up with "N"&"n"

#1

```
nqnqnwnwnenenrnrntntnynynununininononpnpn:n:nlnlnknknjnjnnhnhngngnfnfndnd
nsnsnananznznxnxncncnvnvnbnbnnmnn,n/n2n2n3n3n4n4n5n5n6n6n7n7n8n8n9n9n-n-n
NQNQNWNWNENENRNRNTNTNYNYNUNUNINININONONPNPN°N°NLNLNKNKNJNJHNHNGNGNFNFNFNDND
NSNSNSNANANANZNZNZNXNXNCNCNVNVNVNBNBMNMN?N?N.N.N.NN"N#N#N$N%N_N&N'NN(N)N)
12121313141415151616171718181819191-1-1------2  123456789-9293847575666655
HhHhHhHhHhHhNnNnKkKkMmMmMmNnNnHhHhHhHhHhHhNnNnNnNnNnNnHhHhKkMmNnHhHhHhH
Now is the time for you to take advantage of this opportunity . Now.
Now Is The Time For You To Take Advantage Of This Opportunity . Now.
NOW IS THE TIME FOR YOU TO TAKE ADVANTAGE OF THIS OPPORTUNITY . NOW .
```

BANKING TROUBLE .

#2

Perfect	. Irregular (right)	. Irregular (Left)
Now is the time for Now is the time for you to take advantage of this opportunity to fit yourself .	Now is the time for Now is the time for you to take advantage of this opportunity to fit yourself .	Now is the time Now is the time for you to take advantage of the opportunity to fit

---

TRACKING TROUBLES .

#3

Perfect	Irregular (up)	Irregular(side)
Underwood Typewriter	**Typewriter**	**Typewriter**
This is perfect .	**This is imperfect**	**This is imperfect.**
Paper slipp (dont)	Paper slipping	Cause- lost-
Paper slipp	Paper slipping	motion in carriage
Paper slipp	Paper slipping	and
	Paper slipping	bar - bearings etc.
	1-cause	

#4

Perfect spacing	Irregular Spacing	
This is a sample of spacing .	This is a sample of	nnnnnnn
This is a sample of spacing .	This is a sample of	nnnnnnn
This is a sample of spacing .	This is a sample of	nnnnn
This is a sample of spacing..	This is a sample of	

Page -- VISIBLE DEFECTS -- PRINTED RESULTS #40.

Monarch - Remington Visible
Fox Visible

party wanted..
party wanted.
shadow impression party wanted. Ex.#6.
party wnted .

Example #5

ty wanted to take up these
to the limit of your abili
ge of this opportunity . ti

#7 NON-REVERSIBLE RIBBON which remains stationery when all on one spool. It shows its self by a gradually fainting impression until when the ribbon from constant pounding on this point [illegible] impression results and the ribbon is pushed through. A hole has been punched in The above also shows when the rib.is slow in reversingetc. No eyelets.

#8 Once upon a time when the pigs were swine and the turkeys chewed tobacco and the birds built their nests in old mens beards and well when was such a time . Richmond is the metropolis of the South and will continue to be the busiest town South of the Mason and Dixon line until possibly Atlanta will come to the front. Some time hence tho however.

#9 The ribbon is a dry well used one with several spots of oil of it see how it smears . Often confused with a too heavily inked ribbon.

10 This line on this machine shows a sluggish reverse of ribbon which shows it slow in recovering.

11 This line is written on a line .Notice line on extreme lower edge. This line is not written on the line properly . The points (lower)of p-q-y-j-g-/-go under the line .

12 If the poor alignment of a machine is magnified four times when carbon copies are being made, it has been aligned for single copies.

#13 The appearance of the carbon work should not be improved at the expense of the single copies. Neither should it be necessary to purchase and use a manifolding attachment.

Perfect columns

56
234
67
5565
67

56
576
2
432
45

#14

65 78
53 335
6 4
56 1
2 3

Imperfect Column etc.

#15

6
69
6
5
5
45
46
5
45

6 6 5
63 6
6 5
67 67 2434
5 5 4
46 46 4
76 76 7678
5 5
876 87 76
54 234332

Perfect ---HhHhHhHhHhHhNnNnNnNnNnMmMmKkKkKkLmLmMmNnNnHhHhHhII
Now Is The Time This Is A Sample Of The Work Done On The Und
16 HhHhHhHhHhNnNnNnNnNnNnHhHhHhHhHhHhHhHhHhKkMmMmNnNnEeRrTt
Now Is The Mr. Johnson Roanoke Virginia / Hh You Are On Time
H hHhHhHhhHhhHhHhHhHhHhHhHh and soforth. UNDERWOOD HhHh.n

The Norfolk & Wes trn Railway runs bet ween Norfolk & the We
17 Norfolk & Westrn Rdwy. runs between Norfolk and the west
Now is the ti me for all g ood p eop ppple to come to the
T he N orfolk and W estrn Rdwy. runs between here and Brist

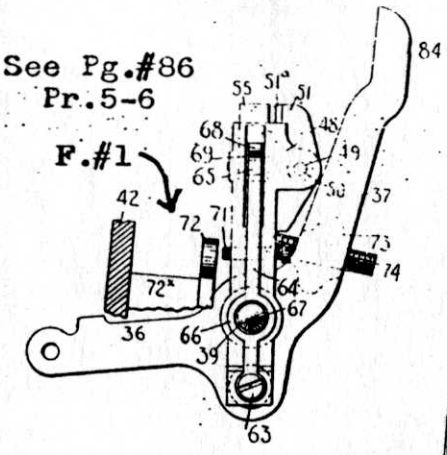
18 HHHHHHHHHhhhhhhhhHHHHHHHHHHHHNNKKKKKkkkkkkkKKKKKKmmmmmmmMMMMN
This is a sample of impressions made from a fresh ribbon. H

19 For a sample of battered type sée #27 below .

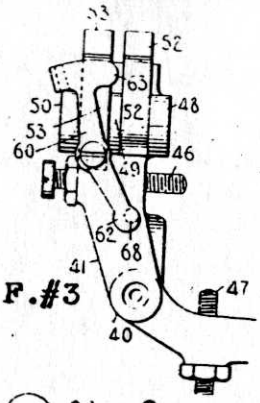
ttttttttttttfrrffttttrffffiii

See Pg.#86
Pr.5-6

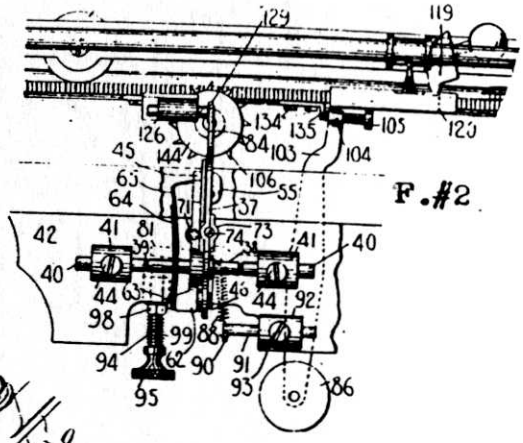
F.#1



F.#3



See Pg.86-Pr.5-6



F.#2

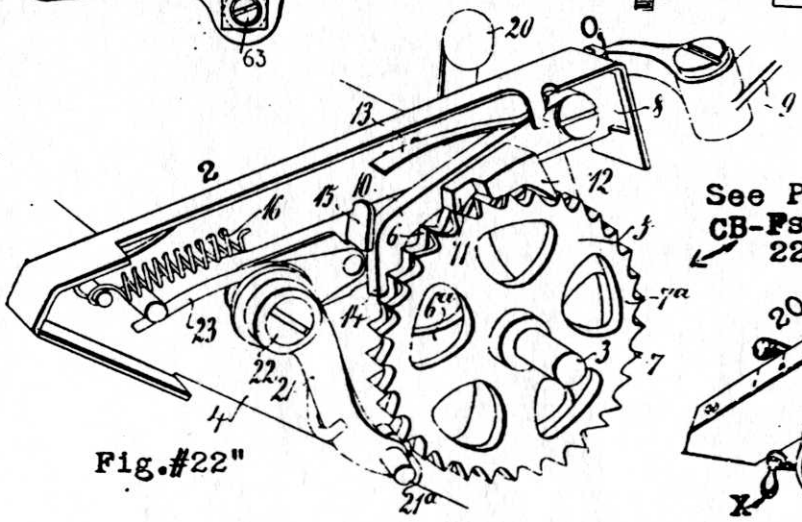
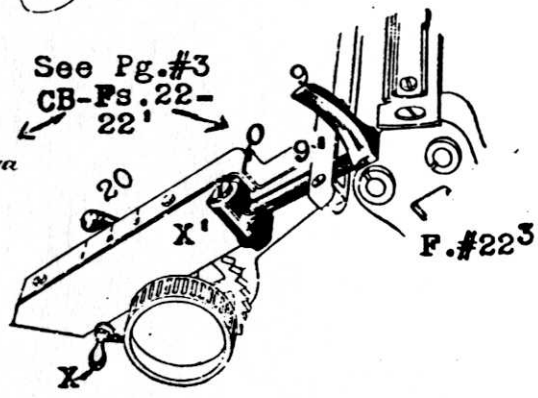


Fig.#22"

See Pg.#3
CB-Fs.22-
22'



F.#22[3]

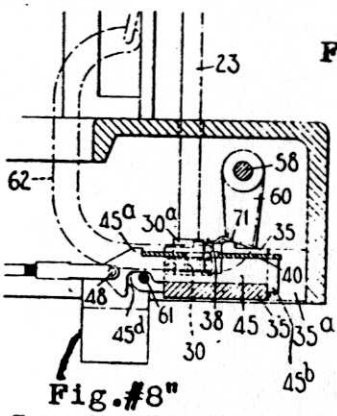
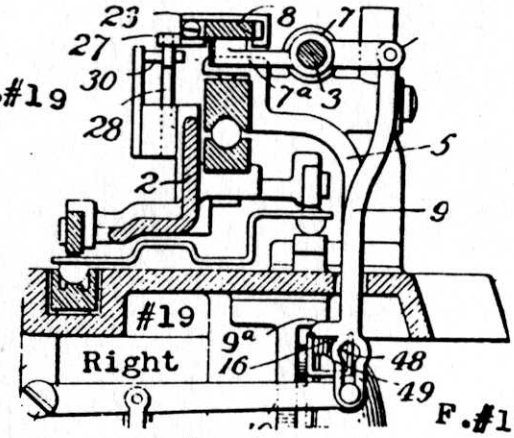


Fig.#8"

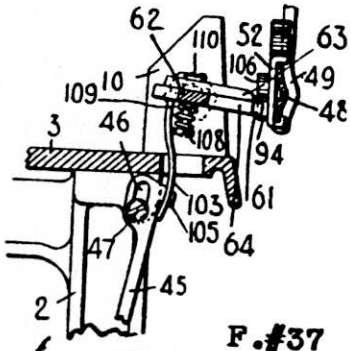
See Pg.26-CB

F.#19



See Pg.#102-Par.#1.

F.#19



F.#37

See CB_Pg.#22
Smith Premier
#10-line-lock

The lower edge of line should coincide with scale edge.

A

B	black	hhpqqthkomn_	ppqqthzlq__pq	tf'"#1aAs_	hpa_pq	●
	red	_6_2-09athpq	q_qQPqpjjt#%-	-tyqpn%prefti	5y^{6}h^{hp}	●
		1	2	3	4	5

		6	7		8	9
C	upper	bhbnbnmhtftftftpg	ttftftqpjlj		fkqweaqptfj	ttrthgt
	lower	gujs_#u$%,mnahbtrg	iuasdfuqrrr			ttthlaT